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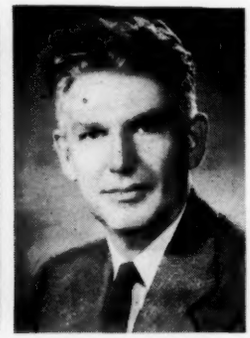
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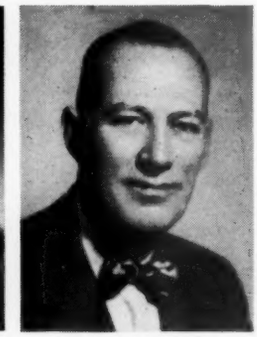
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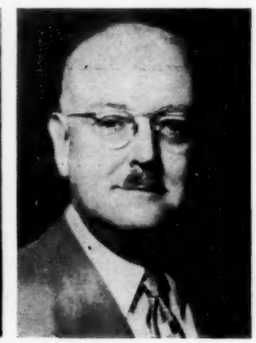
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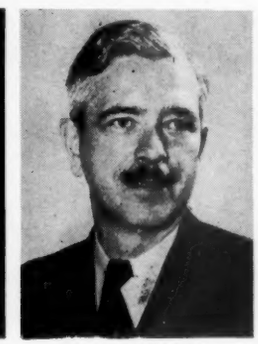
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THURSDAY APRIL 26

Morning

• Operations Research

PRINCIPLES OF OPERATIONS RESEARCH
Herbert H. Jacobs, Asst. Professor, Industrial Engineering Dept., Columbia University, New York City

MAKING USE OF OPERATIONS RESEARCH
Morley G. Melden, Assoc. Ed., "Factory Management and Maintenance," McGraw-Hill Publishing Co., New York

• Material Handling

RELATIONSHIP OF PLANT LAYOUT TO MATERIAL HANDLING
James M. Apple, Professor, Industrial Engineering, Michigan State University, East Lansing, Michigan

FACTORS IN EQUIPMENT SELECTION
Charles S. Schroeder, Dir., Research and Development, Yale & Towne Mfg., Co., Philadelphia

Luncheon

THE ROLE OF EDUCATION IN DEVELOPING MANAGEMENT KNOW-HOW
Dr. Gaylord P. Harnwell, President, University of Pennsylvania, Philadelphia

Afternoon

• Maintenance Control

MAINTENANCE PERFORMANCE CONTROLS
Oliver S. York, Group Supervisor, Engineering Dept., E. I. duPont de Nemours & Co., Wilmington, Delaware

UNIVERSAL MAINTENANCE STANDARDS
Charles F. Stephenson, Chief Indust. Eng., Commercial Division, York Corp., York, Pa.

• Advances in Information Analyses

INFORMATION FLOW ANALYSIS
Adrian McDonough, Director, Taylor Management-Laboratory, Wharton School, University of Pennsylvania, Philadelphia

EVOLUTION OF A COMPUTER APPLICATION
Richard E. Utman, Data Processing Manager, Southern California Divis., Stanford Research Institute, Los Angeles

FRIDAY APRIL 27

Morning

• Work Measurement

AUTO-MEASUREMENT — MECHANIZING TIME STUDY
Charles W. Lake, Jr., V. P., R. R. Donnelly & Sons, Chicago

PHYSIOLOGICAL TECHNIQUES IN WORK MEASUREMENT
Lucian Brouha, M.D., D.Sc., Haskell Laboratory, E. I. duPont de Nemours & Co., Wilmington, Delaware

• Applied Automation

A CASE HISTORY
Damon Van Utt, Vice President, Bruce Payne & Associates, Westport, Conn.

APPLIED AUTOMATION AT THE PLYMOUTH ENGINE PLANT
Carl Demrick, Vice President in Charge of Manufacturing, Plymouth Div., Chrysler Corp., Detroit

Luncheon

MANAGEMENT—WHERE ARE WE GOING?
Joseph L. Kopf, President, Jabez Burns & Sons, New York City

Afternoon

• New Approaches to Cost Reduction

COST REDUCTION THROUGH SCHEDULING
Alex Proudfoot, Specialist in Scheduling Installations, Chicago

A COSTMATICS PROGRAM FOR COMPETITIVE MANAGEMENT
Ernest Schleusener, Vice President, Mfg., Mueller Brass Co., Port Huron, Michigan

• Improving Operating Decisions

QUALITY CONTROL THROUGH INSTRUMENTATION
Clifford W. Kennedy, Training Super., Federal Products Corp., Providence, R. I.

FACTS AND FIGURES FOR BETTER DECISIONS
Richard Muther, Management Engineer, The Vendo Company, Kansas City, Mo.

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OPERATION PEACE-FARE

PROBABLY not since the religious wars of Europe has there been such an ideological basis for military effort as the present world-wide "competitive co-existence" between Russia and the United States. The way citizens of our own and other countries *conceive*, regard, and respond to "the American Way" may turn out to be more decisive than inter-continental missiles.

Russia has announced that only Marxist Armies can exhibit decisive morale. Certainly the "Peoples' Army" of North Korea seemed impressive in the headlines. Other headlines indicate that "the Yankees" may not be gaining but losing popularity in Africa, China, India and even in Western Europe. Certainly the Marxists in America have mutiplied in numbers since 1918.

Frequently we are at a loss to understand our situation. Since 1776 we have carried the torch of progress and hope. Suddenly we seemed cartooned with a burnt out torch and a backward look offering the impoverished millions of the earth little but a mortgage to capital; while the other side this time promises "free land," "free silver," and "liberation" from serfdom, colonialism, wage slavery, and tenancy. Even in the last war our war aims were most often expressed as "get it over with and get home to 'normalcy.'"

This situation is not due to an ideological inadequacy, but to inertia, being caught confused between the slogans and myths of "New Deal" vs. "Big Business," and being off-balance between UN vs. isolationism.

But whatever the reasons, the consequences would seem startlingly unfortunate. It would be very embarrassing for the world's leading exponent of "majority rule" not to be popular with the majority. It would be an irony of history if the descendants of the Minute Men of 1776 should be hours even decades behind history's clock in 1956.

Have we possibly been off on the wrong foot in the campaign to "contain communism?" How well do Americans know that in a football game that side which yells "Hold that line!" is already losing the game? What is this concept—the American Way of Life—let's carry that ball forward.

What is more potent around the world than that religion which regards every person as sacred; than that science which respects, understands, and then transforms every atom of nature; than those political institutions which by "due process" continually evolve the ever timely adjustment of government of, by, and for all the people? What is a surer way to relieve hunger and achieve prosperity than the world-wide promotion of that scientific management which, in the words of Frederick Taylor, multiplies the surplus instead of wasting productive power in a fight about its division. The American way is composed of:

- The brotherhood of man instead of the dictatorship of the proletariat.
- The creative intellect in exploring nature instead of state-censorship.
- The free vote of all citizens instead of brainwashing propaganda.
- Free competition in distributing goods and services for the consumers instead of cartels and bureaucrats and slave labor.

If we speak up firmly but gently, arm for defense but not for swagger, and try to help all mankind forward, what need we fear?

But if, as sometimes seems the tendency, we throttle our world-wide information services, choke world trade, swap bread only for air bases and alliances, how can we contain anybody?

F. F. BRADSHAW

What are the major significant factors for management to consider in improving and integrating its material handling processes? The President of the Material Handling Institute discusses the benefits to be derived from an intensive and integrated material handling program, considers the objectives, physical layout, and types of equipment, and demonstrates the results to be anticipated from an integrated material handling system.

What Is An *Integrated* Material Handling Program?

By George G. Raymond, Jr.
President, The Material Handling Institute
Pittsburgh, Pennsylvania

RECENT studies indicate that moving and storing materials account for 20 to 90 percent of the production costs of companies. Like production, quality, and process controls, material handling is an indirect overhead cost of doing business—in a sense a necessary evil. Material handling is a means to an end: materials being available in the right amounts at the right place and time. Since it is a necessary process, how can management be sure that it is being done most efficiently, how can an integrated material handling program be developed?

Essentially, material handling is a service operation concerned with moving materials to, from, and through industrial processes that add value to the material. Material handling is also concerned with receiving, storing, and shipping raw materials, goods in process, and finished products.

Control of materials has become one of the most important aspects of manufacturing today. Material control has in the past been applied to purchasing, inventory control, and external transportation—shipping, traffic, and receiving. However, in a relatively few years material handling has taken its place alongside these three as an essential part of any materials control program, cutting across all three.

As many progressive companies have demonstrated, purchasing and material handling are closely allied. In the purchase of raw materials, parts, and semi-finished goods, the purchasing department can realize great savings by specifying containers, unit loads, and palletizing shipments by suppliers that will mean reduced costs in purchasing, receiving, and subsequent handling.

Again, inventory control and material handling are closely related. An integrated handling system will eliminate transfers and sorting of material and facilitate the scheduling of materials to and from productive operations. Waiting time is reduced to a minimum. The orderly storage, selection, and movement of inventories and better utilization of cubic space increase production and cut costs.

Finally, material handling is an integral part of economical and efficient shipping, receiving, and traffic operations. This includes economies companies can realize, their suppliers can realize, and common carriers can realize.

A thorough material handling program will affect procedures in purchasing, inventory control, and external transportation in many ways, and all three phases of a company's operations must be kept to the fore in the development of such a program.

There are no rigid formulas and few set rules to follow in developing the integrated material handling program. There is no single series of steps which managers can take to assure improvement in material handling efficiency in their plants. One essential is making an overall, not a piecemeal, approach, reviewing all operations involving material handling in plants, so that the effects of handling changes in one operation on other operations will be considered. A second essential is making an honest and thorough evaluation of processes and all factors involved in the processes, and using an imaginative approach to solving the problems un-

GEORGE G. RAYMOND, JR.

In 1955 George Raymond was elected President of The Raymond Corporation, in which he had worked since 1942 as Sales Manager, Administrative Assistant, Vice President in charge of Sales, and Executive Vice President. This year he also became President of the Material Handling Institute, made up of seventy manufacturers of material handling equipment, which will hold its 1956 Exposition from June 5-8 in Cleveland, Ohio. He is a member of the Young Presidents' Organization and the American Material Handling Society and past President of the Association of Lift Truck and Portable Elevator Manufacturers.

covered. These are the keys to setting up an integrated material handling program that will really serve your operation.

There are four major objectives of an overall material handling program:

1. Increased productivity.
2. Reduced cost of finished product.
3. Improved working conditions.
4. Better distribution.

Each of these objectives adds economies and increases efficiencies, providing the basic reasons why the time and effort involved in developing a material handling program are worth giving to it. Each of these objectives also works for the benefit of management, employees, and consumers.

HANDLING PROGRAM ECONOMIES

From a management standpoint, an effectively administered material handling program can increase production and at the same time substantially decrease costs. The handling program must, however, include an examination of all phases of the overall operation. The objective is increased end product at less cost and every phase of the operation can be effected by what is done in one segment of the operation.

An improved material handling system benefits employees through safer operations, less fatigue, upgrading of jobs with consequently higher wages, and through improved personal comfort.

From the distribution side of the operation, the efficient handling system provides opportunities to improve routing, storing, and ultimately improve customer service. The consumer is interested in receiving undamaged merchandise promptly at a reasonable cost. The material handling system can contribute this added customer satisfaction benefit. A brief glance at some modern material handling systems illustrates the benefits to be achieved through integrated material handling.

An electric utility warehouse in Pennsylvania handles 4 million pounds of stores a month comprised of 4400 different items of all shapes and sizes. An integrated handling system eliminated heavy, hazardous manual handling and receiving platform tie-ups. Additional volume is handled with no manpower increase. Thirty-six warehouses receive faster service; inside and outside storage areas are used to better advantage; *and* overall per-ton cost of handling has been substantially reduced. The equipment used in this system includes fork trucks and pallets. The material handled ranges all the way from transformers and reels of wire to boxes of small insulators.

In one company's foundry, fork trucks save more than $37,000 yearly. Hard-to-handle foundry materials such as firebrick, pitch, and wood flour can now be transported from one area to another rapidly and efficiently. Bulky supplies and patterns are now stored easily, *increasing storage capacity* 500 percent. Manual handling formerly inviting serious injuries and costly unemployment now has been eliminated. Patterns last longer due to more careful handling. Travel time and man-hours involved in hauling patterns have been cut drastically by placing trucks on the job.

A Maine paper manufacturer reports that feeding waste paper to the shredder has been increased 40 percent by use of a fork lift truck. This is only part of the complete material handling program which necessitated an initial investment of $52,000 to realize a saving of $140,000 in the first year of operation. A training program for the manufacturer's employees in the operation of handling equipment and methods converted them from laborers into efficient, indirect production operators with greater skills. Others were trained into direct production operators on expanded production equipment.

BASIC HANDLING QUESTIONS

The basic questions for determining what kind of a material handling system to use are: what material? Where routed? and when scheduled?

"What" covers the material, the form in which it is received, moved, stored or shipped, whether the form is the best possible form in which to handle the material and fit it into production, and changes which might be made to improve production and overall operation.

"Where" includes the routing of material through value-adding processes, in-process and finished goods storage, receiving, warehousing, shipping, and any aspects of the material handling road map. The shortest distance between two points is a straight line. This applies to material handling considerations of "where" between raw materials coming into a plant and finished products leaving a plant.

"When" includes scheduling of material to be where it is needed at the right time and in the right quantity. It includes feeding the productive processes according to a planned schedule and moving semi-finished and finished products from the productive processes according to schedule.

What plus where plus when equals the equipment which will be needed. The equipment to use can only be adequately determined after what, where, and when have been fully explored and analyzed.

The handling system can only be as efficient as the physical layout of a plant will permit. However, a careful analysis of plant layout, along with an analysis of methods can produce some amazing results.

PLANT LAYOUT ANALYSIS

A New England manufacturer of builders' hardware and mechanics' tools has a long, narrow, and multi-storied building. This is the type of building that many people think will not permit the installation of a modern material handling system. The aisles are narrow, there are many, closely-spaced columns, elevators are of low capacity. Conveyors proved to be the solution for material handling in this company's production line. Standardized, interchangeable lengths of belt conveyor and packaged power units were selected and installed. Results: greater flexibility, 50 percent decrease in man-hours on one assembly operation, better quality and production control, less operator fatigue, better housekeeping—and all within the walls of one of those "impossible" buildings.

Material handling is an indispensable factor in any factory, warehouse, production, or terminal operation. It starts at the source of raw material and continues through transporting, receiving, raw material storage, and movement to processing. It is an integral part of the movement from one process to another, in-process storage, and the warehousing and distribution of finished products.

Only when you realize that the handling of materials is an essential part of an operation, and what share of the time involved in that operation is consumed by handling, can you appreciate its importance in relation to the profit and loss statement of your business.

A metal construction company in New York State added a 5-ton, 9-runway crane in their new steel warehouse. Up to 15 truckloads of steel (150 tons) are received in a day. The crane takes

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the steel to storage and from storage to the shears. The man-hours required for this has been cut to one-third; one man in the cab and a man on the floor take care of the entire job.

In addition, the output of six shears has been increased 40 percent. Operators are no longer involved in moving steel from storage to shears. Shears are in operation more time, hence the increased output.

Another time saving part of the operation is the collecting of scrap in specially designed tote boxes. These hold 1000 to 2000 pounds of scrap. The crane takes them directly to outgoing trucks and empties them in a fraction of the time required before.

The kinds of material handling equipment available today are as varied and as adaptable as the many different kinds of operations the equipment must service. However, there are certain basic types of equipment that a potential user of material handling equipment should know about.

Conveyors can be power driven belts or chains, gravity type employing wheels or rollers, or combinations of these types. Some are permanently installed, others are portable. They can be flush with the floor, table high, or up in the air to suit the operation.

Hoists and cranes come in varying sizes and varying types of basic installations. Hoists may be an integral part of the building structure supported by roof trusses or columns or they may be truck mounted. Cranes can be hand powered, hydraulic, or electric. They can be portable or installed on overhead rails, cab operated or floor operated.

Fork lift trucks are available in gas-powered, electric-powered or diesel-powered models. They come in various sizes and with various types of operating characteristics to suit the job, the space in which they are to operate, and the material they are to handle. In addition, they have attachments and adapters that make them almost as skilful and dexterous as man himself.

VARIETIES OF EQUIPMENT

Hand lift trucks may be designed simply to lift a load off the floor enough to then move the material by man power. Others are powered to permit additional ease in moving materials. Still others are "walkies" that lift and stack.

Containers, pallets, and similar equipment come in all shapes and sizes. Some pallets can be picked up from four sides, some from eight positions. Metal containers are available for any type of material ranging from scrap steel and chemical materials to fish and delicate component parts for electrical equipment.

The overhead track systems for monorail installations are available with switches and crossovers that make the system as fascinating as any model railroad layout.

Wheels, casters, floor trucks, tractors, special electrical accessories, tongs, grabs, and special adapters for trucks, cranes and hoists are only a few of the additional items in the long list of material handling equipment available. Basic material handling equipment can be made versatile enough to solve any handling problem.

INTEGRATED SYSTEM RESULTS

An integrated material handling system can contribute to increased production and decreased costs in five ways:

1. Non-productive time of the production process is lessened.

This is the basic contribution an integrated handling system makes to plant operation. Idle machine time and idle operator time are reduced to a minimum by a steady and constant flow of materials and the elimination of time spent waiting for work. In addition, the productivity of production workers is increased by reducing the time they would otherwise spend handling materials.

2. Human fatigue is reduced.

With lifting and handling reduced and even entirely eliminated in some instances employees are freed of muscle work and non-productive employees are released for productive endeavors. Upgrading is possible. Mechanical material handling received a tremendous impetus as a result of World War II man-power shortages. The anticipated labor shortage in the coming years will make mechanical handling more necessary in the future.

3. Mechanical handling is safer handling.

When material is mechanically handled, the plant operation is a safer operation than when material is man-handled.

4. Storage space is used more effectively.

Man-power permits storage four feet from the floor; machine power permits complete use of cubic space—the sky is the limit. Maximum use of existing facilities is possible with mechanical handling.

5. Mechanical handling sets the pace for production.

Mechanized handling equipment influences the rate at which each operation can be performed.

The analysis of your material handling problems takes in much more than a system of machines and equipment. From receiving through all processes, storage, and final shipment, the consideration of material handling must be on the basis that material handling is the system of service which integrates productive and non-productive operations and makes them into one productive unit.

A new set of management control ratios is presented, involving the basic areas in managerial decision-making of price policy, cost control, the rate of utilization of productive capacity, the productivity of capital facilities, and the internal allocation of investment resources. This model is compared and contrasted with those in use by Monsanto Chemical and du Pont. Some secondary control ratios are developed and short and long term interactions among these ratios are explored.

New Managerial Control Ratios

By Bela Gold
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INDUSTRIAL development rests upon two closely interrelated processes: specialization and integration. The increasing specialization of men and machines offers the ever-enticing prospect of still further gains in efficiency along with reductions in cost. But these potentials can be realized only if the growing multiplicity of specialized operations can be effectively fitted together so as to minimize overlapping, conflicts, and dislocations among the parts. For many years now, the engineering and related technical developments which underlie specialization have been forging ahead more rapidly than the capacity of industrial establishments to fully utilize the advances which they offer. And one of the major reasons for this lag has been the failure to improve managerial control techniques, which are the tools of integration, sufficiently to meet the increasing burdens imposed by further specialization.

Under these conditions, some companies have adopted the negative expedient of frankly giving up the struggle to develop the more advanced control techniques needed to integrate vast operations effectively. Instead, they have granted increasing autonomy to their major divisions, thus resigning themselves to foregoing those additional benefits of specialization which would flow from operating each division as part of an organic whole. This may well represent a defensible position for the moment, in view of the obvious shortcomings of available control techniques. But persistent adherence to such a policy tends to prove increasingly costly as engineering progress continues to expand the potentials of further specialization. The most significant progress achieved so far in the development of more effective managerial controls centers around the collection of increasing information about the details of inputs, outputs and costs at all levels of operation. But more information is not enough, no matter how prompt and accurate it may be. Indeed, as current operating information becomes more voluminous, it offers the danger of engulfing management in a mass of findings whose significance for current decision-making is not readily apparent. As a result, top management may either disregard such material, hoping that it is somehow proving useful in the lower echelons, or it may be led into making piecemeal decisions on the piecemeal problems reflected in each of the numerous operating reports.

What, then, is the most serious obstacle to the development of more effective techniques of managerial control? Curiously enough, in view of the constant emphasis on the need to be practical in business, the urgent need is for a theory—or a framework of ideas —which will indicate what aspects of operations constitute the strategic core of operations planning and analysis. Stated somewhat differently, we need a basis for selecting from among the thousands of possible measures which may be employed some small number which will identify the major determinants of success.

In the final analysis, top management cannot evaluate past results, or formulate effective new policies, merely by considering each sector of operations by itself. Its basic problem is to integrate, rather than to collate, the policies of guiding component operations. And this undertaking involves not only the appraisal of alternative price policies, output policies, or means of raising

BELA GOLD

For the past eight years, Professor Gold has directed a study at the University of Pittsburgh's Bureau of Business Research of long term changes in the structure of production costs in more than 200 of the leading manufacturing industries in the United States. This paper is one outgrowth of the research. Dr. Gold was a charter member of the Connecticut Valley Chapter of S.A.M. and has a bachelor's degree in mechanical engineering from New York University and a Ph.D. in economics from Columbia University.

productivity. Top management also faces the more difficult and more important task of analyzing the interacting effects of particular policies in each sector.

Specifically, top management must seek not the best policy in each area of operations, but rather the best combination of component policies—those which most effectively reinforce one another in promoting the guiding objectives of the firm.

The basic purposes of this paper are: to present a new conception of the strategic areas of decision-making; to define criteria for measuring changes in each of these areas; to outline the factors affecting such adjustments; and to explore the interrelationships among the several areas of decision. Every effort will be made to use variables which approximate as closely as possible the recognized foci of managerial data collection and policy formulation. It is hoped that the resulting measures will be generalized enough to permit wide application, and yet specific enough to yield directly useful results when applied to particular plants and firms under actual operating conditions.

I. BASIC AREAS OF DECISION-MAKING

In order to be useful, the criteria for managerial control must be designed in accordance with the objectives which management seeks to promote. The present analysis will begin with the assumption that *management seeks to maximize the rate of net returns on investment*—an assumption which tends to be wholly incorrect only when emphasized to the exclusion of all other objectives.

The areas of decision-making which affect the objective of maximizing the rate of net returns on investment may be determined by proceeding through the five simple stages of analysis reviewed below. In each case, the verbal description of relationships will be supplemented by their translation into algebraic terms as well, in order to highlight the specific measures which are applicable.

1. The ratio of profit (before income taxes) to investment may be regarded as determined by profit per unit of output and by the ratio of output to investment:

$$\frac{\text{Profit}}{\text{Investment}} = \frac{\text{Profit}}{\text{Output}} \times \frac{\text{Output}}{\text{Investment}}$$

2. But profit per unit of output, the first term on the right hand side of equation 1, is determined by the difference between the average gross receipts per unit of output (i.e., average realized price) and average total costs per unit of outut:

$$\frac{\text{Profit}}{\text{Output}} = \frac{\text{Value of Products}}{\text{Output}} - \frac{\text{Total Costs}}{\text{Output}}$$

3. Also, the ratio of output to investment, the final term in equation 1, may be regarded as determined by two factors—the relationship between productive capacity and investment, and the relationship between actual output and productive capacity:

$$\frac{\text{Output}}{\text{Investment}} = \frac{\text{Capacity}}{\text{Investment}} \times \frac{\text{Output}}{\text{Capacity}}$$

4. Accordingly, the ratio of profit to investment is determined (a) by the difference between the average price and average total costs per unit of output; (b) by the ratio of productive capacity to investment; and (c) by the ratio of output to capacity, which is usually referred to as the degree of utilization of productive capacity—or, algebraically:

$$\frac{\text{Profit}}{\text{Investment}} = \left(\frac{\text{Value of Products}}{\text{Output}} - \frac{\text{Total Costs}}{\text{Output}} \right) \times \frac{\text{Capacity}}{\text{Investment}} \times \frac{\text{Output}}{\text{Capacity}}$$

5. Finally, if the emphasis is placed on the ratio of profit to equity investment, rather than on the ratio of profit to total investment, the preceding equation need be altered only by the addition of one term—the ratio of total investment to equity investment:

$$\frac{\text{Profit}}{\text{Equity Investment}} = \frac{\text{Profit}}{\text{Total Investment}} \times \frac{\text{Total Investment}}{\text{Equity Investment}}$$

MAJOR CONTROL FACTORS

Thus, efforts to maximize net returns on equity investment are affected by five major areas of operating policy: those concerned with product prices, unit costs, the degree of utilization of productive capacity, the ratio of productive capacity to total investment, and the ratio of total investment to equity investment (which obviously refers to the structure of capital financing). These represent a blending of short term and of long term perspectives, of income and of capital considerations, of physical as well as of financial aspects of operating relationships, and of factors affecting demand and supply as well as those reflecting growth and instability. The resulting areas of decision-making may, therefore, be regarded as effective foci for the control efforts of top management—and the measures provided may be referred to as an initial model of "managerial control ratios," subject to later elaboration.[1]

APPLICATION OF THIS MODEL

Application of the proposed network of managerial control ratios to the performance records of particular firms or plants will reveal which of the strategic areas of decision-making contributed most and least to observed adjustments in the rate of profits on investment during each period covered by the analysis. Moreover, if the analysis is applied to records covering an extended period of years, resultant findings may be expected both to reveal any persistent trends in the sources of upward and downward pressures on the rate of returns and also to spotlight the sectors most likely to shift between exercising favorable and unfavorable effects.

All of the data required for applying the proposed control ratios are readily available in most companies, with the possible exception of appropriate measures of aggregate physical output and of productive capacity. The first of these presents no problem, however, inasmuch as all industrial establishments have complete information about the volume and value of all categories of production—from which the needed measure can be readily developed. Briefly described, the change in the physical volume of total output between two periods is determined by weighting the change in the volume of output of each product category by the average price of the category in the two periods, and then aggregating the results.[2]

[1] *The first equation might just as usefully have begun by viewing the ratio of profit to investment as determined by the ratio of profit to the value of products (or to sales) and by the ratio of the value of products to investment. But the value of products is determined by the product of physical output and the average price. Hence, average price would have appeared in the denominator of the ratio of profits to value of product and in the numerator of the ratio of value of product to investment—cancelling one another and leaving the original equation as presented in equation 1 above.*

[2] *For a more detailed discussion of physical output measurement, see Solomon Fabricant,* The Output of Manufacturing Industries, *New York, National Bureau of Economic Research, 1940, pp. 22-35, 358-374.*

Although the precise measurement of productive capacity presents serious problems in theory, reasonably acceptable estimates of practical capacity can generally be made without excessive effort. The basic data required are usually available as the by-product of various plant operation and control functions, including engineering, production control and the establishment of cost and production standards. Moreover, at least rough estimates of productive capacity are also required for production planning, capital goods procurement, the balancing of work loads and other areas of decision-making. In actually developing such estimates, the task is usually simplified by concentrating on the level of capacity which can be attained at present and sustained under practical operating conditions—on the assumption that products and processes will remain unchanged, that sufficient labor and materials will be available to service the full utilization of capital facilities, and that prices and costs will be such as to encourage the efficient utilization of all except clearly marginal and obsolete resources.

OTHER MODELS COMPARED

Although the foregoing model is to be developed somewhat further in succeeding sections of this paper, it may be of some interest to compare it with some of the models which are apparently in use for similar top management control purposes in major industrial corporations. The Monsanto Chemical Company, for example, is reported to use the following array of control ratios:[3]

1. Profits on Investment
2. Net Income on Investment
3. Sales to Property
4. Selling Expense to Sales
5. Operating Expense to Sales
6. Cost of Goods Sold to Sales

In the same industrial grouping, E. I. du Pont de Nemours & Company apparently concentrates on the following network of relationships:[4]

1. Inventories + Accounts Receivable + Cash = Working Capital
2. Working Capital + Permanent Investment = Total Investment
3. Mill Cost of Sales + Selling Expense + Freight and Delivery + Administrative Expenses = Cost of Sales
4. Sales — Cost of Sales = Earnings
5. Earnings ÷ Sales = Earnings as Percent of Sales
6. Sales ÷ Total Investment = Turnover
7. $\frac{\text{Sales}}{\text{Total Investment}} \times \frac{\text{Earnings}}{\text{Sales}} =$ Return on Investment

It is obvious, of course, that any framework of control ratios can be soundly appraised only in relation to the user's purposes. Inasmuch as objectives may differ widely among companies, a comparison of such models can only call attention to differences and similarities, rather than to advantages and disadvantages. Note should also be taken of the fact that the above statements undoubtedly represent only summaries of the control ratios used, rather than detailed descriptions.

A comparison of these summary versions of the Monsanto and du Pont control guides reveals certain differences. For example, the du Pont approach includes more detailed consideration both of the ratio of component costs to sales, and of the ratio of capital components to total investment. At the more aggregative level, both companies are concerned with the following ratios: cost of sales to sales; sales to investment; and earnings to investment—the sole difference at this level being that the du Pont approach includes the ratio of earnings to sales, while the Monsanto approach apparently does not. In short, these two sets of control ratios are essentially similar in content, though differing in the details included in the summary statements under examination. Both may be characterized as focussed on costs, sales, earnings and investment—very much along the lines of the familiar network of ratios applied to the analysis of corporation financial statements.

When these industrial models are compared with the model which has been proposed in the present paper, certain major differences are apparent along with important similarities. The proposed model covers the aggregative financial ratios included in the Monsanto and du Pont approaches. In addition, however, the proposed model also includes consideration of changes in price, output, productive capacity, the rate of utilization of productive capacity, the relative investment required per unit of productive capacity, and the structure of financing. These additional bases for managerial control obviously cannot be used in place of the financial ratios. But it also seems reasonable to suppose that, in most industrial situa-

[3] *As reported in* Business Week, *December 6, 1952, under the heading, "How a Big Company Controls Itself," on the basis of Monsanto's presentation to a conference on finance sponsored by the American Management Association.*

[4] *C. A. Kline, Jr., and H. L. Hessler, "The du Pont Chart System for Appraising Operating Performance,"* N.A.C.A. Bulletin, *National Association of Cost Accountants, August 1952, Section 3, pp. 1,595-1,619.*

Edward Bacon Wilber

THE Washington Chapter lost a most distinguished member and staunch friend on January 2nd. Edward B. Wilber was Deputy Assistant Secretary of State for Administration and widely known as one of the Government's most able administrators. The Congress recognized his ability by twice enacting special provisions for increasing his compensation; in 1951 he was made a GS-17 and the last session raised this to GS-18.

Ed served the Washington Chapter in many capacities which included: chairmanship of the Budget and Accounting Roundtable and numerous committees; Vice-President for Programs; President in 1946-47 when the chapter reached its membership peak and was awarded for the second time the Emerson Award for outstanding accomplishments; National Director; and currently was an advisor to the Executive Committee. In recognition of these services, Ed was made a Fellow of the Society.

Ed was born in Fairport, New York, on September 24, 1902; received his B.A. at Union College in 1925; accountant and statistician for a manufacturing concern 1925-28; business machine company 1928-29; and 1931-36; administrative consultant, State of Maine 1930; management consulting organization 1936-40; assistant group head Estimates Division 1941-45 and chief Business Methods branch 1945-48, Bureau of the Budget; chief Division of Organization and Budget Department of State 1948-49; Director Office of Budget and Finance 1950-54; Deputy Assistant Secretary for Administration 1954.

Ed was also known for many other activities which included: advisor to the first Hoover commission, lecturer at American University and Department of Agriculture Graduate School, and director of the National Committee for Christian Leadership.

This small tribute by his friends and associates in S.A.M. is not adequate for the leadership, intelligence, diplomacy, imagination, and friendships which he so generously extended to us, but it is more than Ed would have asked.

Mary Cushing Niles

tions, management would secure additional, practically useful guides to control with a system of managerial control ratios which supplements purely income, outgo and investment relationships with a variety of measures designed both to provide representation of the physical side of production and also to bridge the gap between the physical and the financial aspects of operations.

II. SECOND LEVEL CONTROL RATIOS

Managerial control ratios may be used either to appraise past patterns of performance or to plan adjustments for improving future performance. In either event, attention must be given both to the factors affecting changes within each of the strategic areas of decision and also to the results of interactions among adjustments in different areas. The present section will briefly explore the first of these tasks, leaving the analysis of interactions to the next section.

Changes in the average price received from the sale of products are directly affected both by changes in the price charged for each product and by changes in the relative volume of different products sold. This may be illustrated by the fact that even when the price of each product is raised by ten percent, the average price received for all products sold may decline, if the sale of the lowest-priced products increases much more rapidly than sales of the higher-priced products. Accordingly, the first managerial control ratio might be supplemented by measures designed to show the extent to which changes in the average price received for all products sold were due to changes in individual product prices as over against changes in the proportion of total sales accounted for by the various product categories.

To proceed but one step further, one may inquire briefly into the factors most likely to influence adjustments in product prices and in the relative sales of the various products. It seems apparent that management can generally exercise greater control over the former than over the latter—for individual product prices can be altered by direct managerial decree, whereas the relative levels of output of the various products are often more closely controlled by consumer decisions than by the preferences of the producer. Thus, by clearly distinguishing between the adjustments in each of these factors, the suggested analysis helps to reveal the relative influence of these different sources of pressure on actual changes in the average level of prices received for total sales.

Changes in average total costs per unit of output, the second of the primary managerial control ratios, may be traced initially to changes in the component unit costs, i.e., to changes in unit material costs, in unit wage costs and in the remaining categories of unit costs. And the effect of a change in any unit cost category on total unit costs depends not only on the percent change in that sector of unit cost, but also on the proportion of total costs accounted for by that category. Thus, a ten percent increase in a category accounting for one-fifth of total unit costs will obviously have less impact than a five percent increase in a category accounting for one-half of total unit costs.

Determination of the relative magnitudes of the various cost categories provides more than a means of computing changes in total unit costs; it adds another important guide to managerial control efforts. Thus, long term trends in cost proportions may alert management to cumulative changes requiring a reconsideration of habitual judgments concerning the major sources of pressure on costs. In addition, a knowledge of cost proportions should help management to decide in what areas its cost reduction efforts might be concentrated most fruitfully. Still another application is indicated by the fact that some of the most important reductions in total unit costs result not from general reductions in all cost categories, but rather from innovations involving increases in some categories which make possible more than equivalent reductions in others. This has been the pattern offered by mechanization, by increases in the scale of production and by the expansion of supervisory and managerial control functions.

RELATIONS BETWEEN FACTORS

To proceed one step further, changes in any category of unit costs may be regarded as the resultant of changes in the average price of the input factor and of changes in the quantity of the factor used per unit of output. Changes in unit material costs, for example, are attributable to changes in the average price paid for purchased supplies and to changes in the quantity of materials used per unit of output. Changes in unit wage costs may likewise be traced to changes in average wage rates and to changes in the quantity of labor required per unit of output. And similar means may be used to determine the immediate factors affecting adjustments in other unit cost categories.

In short, adjustments in average total costs per unit of output—the second of the primary managerial control ratios —may be usefully supplemented by measures of the relative magnitude of the various cost categories, of changes in the average price of each input factor and of changes in the quantity of each input factor used per unit of output.[5]

The relationship between physical output and productive capacity, the third managerial control ratio, may be regarded as the point of interaction between the volatility of market demand and the relative stability of capital facilities and production processes, or between factors subject to substantial changes in short periods and those tending to change materially only over longer periods.

In the short run, adjustments in the

[5] *For a detailed review of the factors affecting the productivity of each input factor, or the relative inputs required per unit of output, see the author's* Foundations of Productivity Analysis, *University of Pittsburgh Press, 1955.*

CHAPTER PERFORMANCE AWARDS REPORT

For Period of July 1, 1955 to January 31, 1956

Hudson Valley	6219	Los Angeles	3889
Providence	5843	Lehigh Valley	3722
Lancaster	5616	Saint Louis	3608
Knoxville	5407	Dallas	3588
Indianapolis	5210	Clearing	3486
Cleveland	5199	Baltimore	3483
Greensboro	5175	Richmond	3354
New Haven	5131	New Orleans	3212
Philadelphia	5024	Worcester	2869
Wilmington	4990	Montreal	2842
Raritan Valley	4838	New York	2836
Bridgeport	4690	Portland	2475
Tren.-Del. Val.	4636	Madison	2439
Nashville	4621	Central Pa.	1737
Western N. C.	4612	San Francisco	1654
Milwaukee	4607	Western Mass.	1538
Northern N. J.	4593	Georgia	1526
Chicago	4588	Central N. Y.	1512
Boston	4543	Detroit	964
Washington	4543	Athens	454
Columbus	4352	Calumet	
Pittsburgh	4319	Charlotte	
Binghamton	4300	Cincinnati	
Kansas City	4216	Dayton	
Sacramento	4152	Fox Valley	
Greenville	4127	Hartford	
Twin City	4118	Northern Ala.	
Reading	4106	Puerto Rico	
Alabama	3963	Stamford	
Northeastern Penna.	3941		

degree of utilization of capacity are generally due primarily to variations in the level of output. In turn, changes in the output of a given plant or firm may be traced to the interaction between changes in the total market for such products and changes in the proportion of the total output accounted for by the given plant or firm. And the same approach may be applied to each product category, thus permitting still deeper penetration of the factors influencing adjustments in the total output of the given firm or plant.

In interpreting the findings resulting from such analysis, changes in the proportion of the total market accruing to the given firm may be regarded as a measure of adjustments in the relative strength of its competitive position in relation to other producers of similar products. On the other hand, changes in the total market for the goods being studied may be attributable either to adjustments in consumer purchasing power, or to changes in the competitive position of the given industry as compared with other industries pressing for a larger share of total consumer expenditures.

Over the longer run, changes may be expected both in output and in the level of productive capacity. But there is no basis for expecting any long persisting trend towards expanding or narrowing the gap between them, for capacity tends to be adjusted through time to the trend in physical output. Thus, the degree of utilization may fluctuate substantially from month to month or from year to year, but any tendency towards progressively higher or lower rates of utilization merely engenders offsetting changes in the level of capacity.

COMPONENTS OF FACTORS

The further development of managerial controls in this area may also warrant efforts to separate the components of under-utilization into three categories: that attributable to the carry-over of facilities which can no longer be fully utilized because of permanent declines affecting older processes and markets; that attributable to over-expansion in new areas of operation in anticipation of developing markets; and that attributable to fluctuations in established areas of demand.

Changes in physical productive capacity are obviously attributable in far greater measure to changes in the volume and nature of the investment in fixed capital facilities and equipment than to changes in the sheer volume of working capital. Moreover, productive capacity is determined in far greater measure by engineering decisions concerning the types of facilities and processes to be employed than by financing decisions concerning the volume and allocation of the liquid capital funds being employed. On the other hand, engineering decisions are likely to play but a subordinate role in the formulation of the financing policies which determine the magnitude of total investment and its allocation.

EFFECTS OF INVESTMENTS

Accordingly, adjustments in the ratio of productive capacity to total investment may be regarded as the resultant of changes in two distinctive areas of managerial decision-making: in the productive capacity of the facilities and equipment embodying the fixed investment; and in the proportion of total investment devoted to such capital goods. The former measures changes in the relationship of productive capacity to fixed investment, and may be termed the productivity of fixed capital; the latter measures the proportional division of total investment between fixed and current assets, and hence reflects adjustments in the internal allocation of the firm's capital resources. These relationships may be expressed algebraically as follows:

$$\frac{\text{Productive Capacity}}{\text{Total Investment}} = \frac{\text{Productive Capacity}}{\text{Fixed Investment}} \times \frac{\text{Fixed Investment}}{\text{Total Investment}}$$

Changes in the ratio of productive capacity to fixed investment may be traced initially to the effects of two sectors of managerial decision-making. The first concerns the relationship between (a) the rate of decline in the effective productive capacity of the capital goods on hand as a result of progressive wear and aging and (b) the rate at which depreciation and obsolescence charges are reducing the remaining investment in such goods. The second, and usually less influential sector, concerns the relationship between the productive capacity of new goods and the price paid for them.

Changes in the ratio of fixed investment to total investment tend to reflect managerial estimates of the relative need for productive capacity as compared with the need for working capital. Changes in the volume of fixed investment may be attributed to modifications in the relationship between the desired level of productive capacity and the average productivity of capital facilities and equipment. Thus, an increase in the latter which exceeds the prospective increment in market demand tends to engender a reduction in fixed investment, as soon as such a change can be effected. On the other hand, productive capacity can be increased more rapidly than the average productivity of capital facilities and equipment only by expanding the volume of fixed investment.

The last of the primary managerial control ratios relates to the structure of capital financing as measured by the ratio of equity investment to total investment. This ratio provides a means of measuring changes in the relative proportions of equity funds and of borrowed funds' in supplying the capital resources of the enterprise. Such proportions may change either as the by-product of adjustments in total investment, or as the result of direct efforts to replace borrowed funds with equity financing.

Changes in the total volume of investment may result from a change in

CHAPTER MEMBERSHIP STANDINGS AS OF March 1, 1956

New York	397	Providence	70
Philadelphia	376	Richmond	70
Northern N. J.	368	Knoxville	69
Cincinnati	304	Long Island	69
Chicago	285	North Alabama	68
Cleveland	270	Columbus	65
Lancaster	266	Tren.-Del. Val.	65
Pittsburgh	237	Reading	64
Detroit	202	Alabama	63
Boston	194	Clearing	59
Washington	193	Central Pa.	55
San Francisco	168	Calumet	53
Milwaukee	159	Hartford	53
Dallas	144	Greenville	51
Los Angeles	130	Charlotte	47
Worcester	125	Western Mass.	46
Indianapolis	121	Twin City	45
Western N. C.	114	Central N. Y.	44
Raritan Valley	107	Fox Valley	42
Montreal	106	Lehigh Valley	42
New Haven	104	St. Louis	39
Binghamton	100	Madison	36
Hudson Valley	100	New Orleans	35
Greensboro	96	Athens	34
Baltimore	94	Nashville	32
Kansas City	92	Northeastern Pa.	28
Dayton	85	Portland	27
Bridgeport	77	Louisville	17
Wilmington	75	Stamford	16
Sacramento	74	Non-Chapter	102
Georgia	74	Non-Resident	83
Puerto Rico	72		

investment requirements, or from an effort to adjust to a change in the volume of investment funds currently available to the company. Investment requirements may increase because of managerial decisions favoring increases in productive capacity, or intensifying the need for working capital. Total investment may also increase because the ready availability of additional capital funds induces management to search for means of utilizing such resources effectively. In either event, the ratio of equity investment to the total is likely to change because conditions in the capital markets are rarely such as to counsel the acquisition of borrowed and of equity funds in the same proportions as had prevailed prior to the increase.

III. CONTROL RATIOS AND DECISION-MAKING

Industrial operations represent the continuous interaction of a broad array of policies and activites. Hence, in addition to considering changes in each of the foregoing control ratios, top management decision-making also requires analysis of the interactions among these ratios—over-all results being the product of such interactions. Incidentally, it may be worth noting that this need applies equally to any system of control measures—thus suggesting useful extensions of the familiar ratio analysis of financial statements.

Managerial concern with interactions among specialized aspects of operations is emphasized in the proposed guides to decision-making by the successive linking of control ratios which contain terms identical with those in adjacent ratios. As a result, it becomes necessary to consider the relationship of a change in output or capacity or investment to each of at least two other aspects of operating performance. For example, a change in the level of productive capacity affects the rate of profits both through its influence on the ratio of output to capacity and through its influence on the relationship of productive capacity to the level of fixed investment. But an increase in capacity alone tends to lower the ratio of output to capacity, thus tending to lower the rate of profits, while the same increase in capacity alone tends to raise the productivity of fixed capital, and hence to increase the rate of profits. Hence, the objective of maximizing the rate of profits requires primary emphasis not on the sheer level of productive capacity, but rather on effecting increases or decreases in capacity by such means as are likely to maximize the net advantages of resultant changes both in the utilization of capacity and in the productivity of capital investment. And there is, of course, a parallel need for simultaneous consideration of the interacting effects of adjustments in each of the other variables comprising the proposed managerial control ratios.

Although a detailed review of all possible interactions among the primary control ratios would obviously lie beyond the scope of this paper, the use of some illustrative examples may help to call attention to the kinds of interactions which may require managerial consideration in the course of practical decision-making.

Within relatively short periods of time, it is usually reasnable to assume that productive capacity, the allocation of investment between current and fixed assets, and the structure of financing are subject to but minor variations. Hence, efforts to maximize the rate of returns on total investment would center around adjustments in price policy, in average unit costs and in the level of output.

SHORT TERM ADJUSTMENTS

Product prices may be affected by changes in unit costs and by changes in the relationship between demand and output, as well as by changes in the price policies of competing suppliers. Unit costs may be affected by changes in the price of needed resources, by changes in the level of product prices, by changes in the level of output, and by changes in productive efficiency. It need hardly be added that the level of output may be affected by changes in product prices and unit costs, as well as by changes in demand and in the availability of needed input resources. Thus, management's efforts to maximize the rate of returns on equity capital requires a continuous effort to realize the changing optimum balance among all of these interacting pressures. And this might lead it to expand or to contract output, to raise or to lower product prices, and even to accept increases in unit costs and decreases in productive efficiency (despite an unwavering preference for decreases in unit costs and increases in productive efficiency). The course chosen for any one of these factors would thus depend on anticipated changes in the other factors and especially on management's estimate of their combined effect on the rate of returns.

Attention turns next to analyzing interactions among the three determinants of longer term adjustments in the rate of profits: the relationship between productive capacity and fixed investment—or the productivity of fixed capital; the relationship between investment in fixed assets and total investment—or the internal allocation of capital resources; and the relationship between equity financing and total investment—or the structure of financing.

LONG TERM ADJUSTMENTS

An increase in the productivity of fixed capital may be utilized so as to increase, maintain or reduce productive capacity, depending upon market prospects. If productive capacity is merely to be maintained, it makes possible a reduction in the level of fixed investment, thus tending to bring about a reduction in the ratio of fixed investment to total investment. And the latter development, in turn, would involve either an increase in working capital or a reduction in total investment—the latter affecting the structure of financing. Alternatively, an increase in capacity which is proportionate to the gain in the productivity of capital might exert its primary impact on other managerial control ratios through the resultant pressure for expanding output, so as to prevent a burdensome increase in the under-utilization of capacity. In this case, management might have to lower product prices, or increase sales and advertising expenses, or finance increased inventories, or extend further credit to dealers or consumers—the particular course chosen determining which control ratios will be altered.

Similar interactions might be considered in evaluating the effects of changes in the allocation of total investment among alternative uses. An increase in fixed investment is often likely to involve an increase in productive capacity. If capital goods prices are relatively high at the time, as is commonly the case during periods of general plant expansion, this may involve a reduction in the ratio of productive capacity to fixed investment. Moreover, increases in capacity through the introduction of additional facilities may involve at least a temporary reduction in the ratio of output to capacity—until

such facilities are brought into efficient production and until markets are expanded accordingly. Such gains in capacity may also increase working capital requirements, thus tending to affect the level of total investment. On the other hand, the initial pressure for changing the allocation of investment may be engendered by increased needs for working capital. In that event, management may seek either to reduce the investment tied up in fixed assets—generally a slow process, unless certain operating units are sold—or to undertake additional financing.

It is also apparent from earlier stages of the discussion that changes in the structure of financing may interact with several of the other basic foci of managerial decision-making — including costs, capacity levels, the productivity of fixed assets, and the allocation of available investment resources.

SIGNIFICANT INTERACTIONS

For practical purposes, managerial decision-making must also take account of the interactions between adjustments in the control ratios which tend to be variable in the short run and adjustments in the control ratios likely to undergo significant changes only over longer periods. Whenever substantial changes do take place in capacity, investment levels or the structure of financing, such adjustments constitute additional pressures for change in the more volatile control ratios—as has been indicated in several of the preceding examples. Short term fluctuations in prices, unit costs and output levels are not likely to force significant adjustments in the productivity of capital, in the allocation of investment resources, or in the structure of financing. But these latter are likely to be responsive to persistent trends in price, cost and output levels.

Attention has already been called to the fact that persistent trends in output tend to engender similar adjustments in capacity, thus minimizing the prospect of persistent trends in the ratio of output to capacity. And managerial efforts to minimize the effects of unfavorable trends in prices and costs are likely to center around reducing the relative importance of the input categories characterized by the most unfavorable trends in cost per unit of output. For example, in industries faced by trends in unit labor cost which are less favorable than trends in capital costs per unit of output, managements may intensify mechanization and automation—with concomitant adjustments in the allocation of investment between fixed and working capital, as well as in other control ratios.

IV. SUMMARY AND EVALUATION

This paper began by emphasizing the need for guides to practical managerial decision-making which would bridge the gap between the results revealed by financial statements and the adjustments in operations and policies which determine such results.

As a mean of helping to provide such tools, the following networks of managerial control ratios were suggested:

$$\frac{\text{Profit}}{\text{Total Invest.}} = \left(\frac{\text{Value of Products}}{\text{Output}} - \frac{\text{Total Costs}}{\text{Output}}\right) \times \frac{\text{Output}}{\text{Capacity}} \times \frac{\text{Capacity}}{\text{Fixed Invest.}} \times \frac{\text{Fixed Invest.}}{\text{Total Invest.}}$$

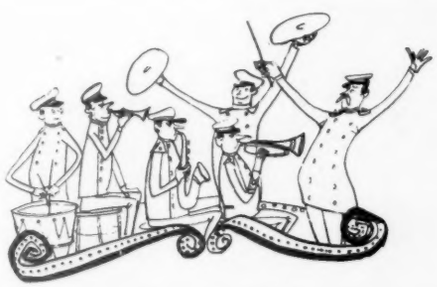
$$\frac{\text{Profit}}{\text{Equity Invest.}} = \frac{\text{Profit}}{\text{Total Invest.}} \times \frac{\text{Total Invest.}}{\text{Equity Invest.}}$$

The first of these may be interpreted to mean that changes in the rate of profits on total investment may be attributed to the interaction of adjustments in five basic areas of managerial decision-making: price policy; cost control; the rate of utilization of productive capacity; the productivity of capital facilities; and the internal allocation of investment resources. The second indicates that changes in the rate of profits on equity investment are also affected by a sixth basic area of managerial decision-making: changes in the structure of capital financing.

In addition, preliminary consideration was given to the development of secondary control ratios which would facilitate tracing the sources of observed changes in each of the primary control ratios contained in the above equations.

Evaluation of the proposed measures indicates that they cover important sectors of practical decision-making and that the data required for their application could be readily assembled in most enterprises. Additional advantages include: simultaneous coverage of a wider range of basic areas of performance than is commonly accommodated; applicability not only to single product operations but also to the multiple product operations which are more widely prevalent; and inclusion of the physical aspects of operation as well as of financial aspects, of income factors as well as of balance sheet factors, and of long term as well as short term components of industrial operations. It may also be of interest to note that this approach exemplifies the kind of analytical framework whose development is essential to the fuller realization of the potential contributions to managerial decision-making of "operations research" and similar systems of appraising the objective components of policy alternatives.

Among the limitations of the analysis, the most important concerns the need to develop supplementary guides for promoting objectives other than those centering around maximizing the rate of net returns on investment. ■



CHAPTER HONOR ROLL

CONGRATULATIONS to the current leaders in the Chapters' Membership Campaign. Quotas attained to date are:

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Have you examined your safety conscience lately? Holding that accident prevention merits careful thought in any company, no matter how large or small, the author discusses some of the basic safety principles, points up many of the factors which may be significant in appraising your current safety status, and suggests a selected safety bibliography.

How's Your Safety Conscience?

By Joseph W. Powers
Refining Safety Engineer
California Texas Oil Co., Limited
New York, N. Y.

HAVE you ever wondered why it is that some things which seem fairly obvious to you cause others so much difficulty? It isn't just that they haven't been exposed to the same facts or the same experiences that you have. In most cases they probably have but still they react differently. The more I go 'round and 'round with my son in an effort to get him to grasp the "simplest" of fundamentals in arithmetic, the more I realize that there's something to this problem besides just stating the facts. The experts have a name for a field dealing with this kind of difficulty; they call it "communication." I'm not going to dwell on the subject but I do want to emphasize its importance, particularly in those activities having to do with training, promoting, and selling. There are many aspects to the problem of communication but the one that seems to give me the most trouble might be called the "blindspot" of obviousness.

When I'm unable to influence people (especially my youngsters) to take certain action or adopt certain attitudes, it is not always immediately apparent to me why this happens. I suspect it is because in time each of us tends to deal in convictions which have long since been stripped of the reasons leading to them. But, if this is the answer, then a greater attention to details in presenting our arguments should improve our communications and our effectiveness. I wonder. Perhaps you can help me by cooperating in a little experiment. I have in mind a hypothetical situation—hypothetical at least from my viewpoint but perhaps very real from yours. Assume that you are the president of a company which has made relatively little progress in preventing accidents either because your extensive program is ineffective or because little time and effort have been devoted to this matter. I will try to prevail on you to do something about it and, in particular, to start with a review of certain basic safety philosophies or principles. I would like to know either at what point you agree to take the action suggested, or why you will not.

Let's start with some straightforward reasoning. My thesis is that a review of basic safety philosophies is in order if significant accident reduction progress is not being made. You realize, of course, that to the successful advocates of safety such a thesis will certainly not seem very profound—much less requiring proof. But rather than risk a "blindspot" so early in the game, I will offer you the following reasoning:

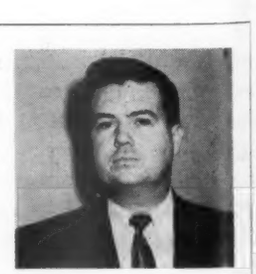
1. It is generally accepted that the planned approach to any problem produces better results than a haphazard one.

2. Planning may vary in degree from an elaborate program to split-second premeditation, depending on the magnitude or importance of the problem or circumstances affecting it, but, in all cases, success will depend heavily in the long run on the soundness of the underlying principles on which the plans are founded.

3. There is considerable evidence that successful accident prevention efforts are the result of careful planning.

4. There are certain basic principles or axioms peculiar to the accident prevention field.

JOSEPH W. POWERS



After working with various design, construction, cost and safety problems of the Refining Division of the California Texas Oil Company for the past seven years, Joseph Powers presently devotes full time to supervising refinery safety planning activities. He previously worked as production supervisor with American Aniline Company, served as a damage control officer in the Navy, and holds the B.Ch.E. and M.B.A. degrees.

5. While safety progress depends on the successful application of these principles and, therefore, on people, it ultimately reflects the basic tenets of top management, since human nature is pretty much the same the world over and responds to sound leadership.

6. Therefore, if significant progress is not being made, management should review its basic safety principles, and adjust its program accordingly.

What's that you said? You already believe in 'planning'—couldn't have gotten this far without it—but there's a limit to the time and money that can be spent on minor items, and your staff is already devoting as much as it can to the problem of safety. Well, if convincing you that other firms comparable to yours, perhaps some of your competitors, get much better results from the same expenditure of time and money is all that is necessary, the problem becomes simple since this is merely a question of fact and the facts are available.

But you say you don't see how dealing in principles is going to save any lives or money in your plant. Besides, you've delegated this job to one of your supervisors and he's a pretty practical guy, not a philosopher. Even if you took time out to get acquainted with this safety business and its so-called underlying principles, how would that help the safety supervisor? His problems vary all over the lot and he has all he can do to keep up with them. He's tried lots of different techniques but they don't always help much. Sure, some firms make out better but then isn't there a lot of luck connected with this accident business?

ACCIDENT FIGURES

I would like to answer mainly those comments which are in line with my present purpose of selling you on the need for reviewing basic safety principles and I can see that, to do that, I will have to be more specific and mention some of the problems you definitely need answers to if you hope to reap the profits available in this field. Perhaps it will not hurt, however, to diverge for a few minutes to fill in some of the pertinent gaps in your knowledge of the safety movement. I'm hoping, of course, that it will whet your interest enough to persuade you to pursue it further and enable you to answer some of your own doubts and misgivings about organized accident prevention.

The Editor
ADVANCED MANAGEMENT
74 Fifth Avenue
New York City

Dear Sir:—

I was greatly interested in the article in the February issue of ADVANCED MANAGEMENT, "Management Level Job Evaluation" by Robert E. Sibson. I thought it was very well written and contained much sound thought.

It may be of interest to readers who have seen this article to know that we have made about 40 installations of high level job evaluation using the Guide Chart-Profile Method. In most of these cases, the plan includes all salaried positions—from the office boy to the president. While it is true that there are differences in the requirements for routine jobs and for technical and executive jobs, it is nevertheless a fact that the Guide Chart-Profile Method adapts itself to all types of jobs in one plan with one salary scale.

The best evidence that this method is effective, both at high levels and at all ranges in one scale, is found in the list of companies that are using it satisfactorily. Among the companies which use the plan for all executive, technical and specialized jobs, and some of them also for routine jobs are the following:

American Brake Shoe Company
Burroughs Corporation
Connecticut Bank and Trust Company
E. I. du Pont de Nemours Company
Mutual Benefits Life Insurance Company
Pillsbury Mills, Inc.
Rockwell Manufacturing Company

Sincerely yours,
Edward N. Hay, President
EDWARD N. HAY & ASSOCIATES, INC.
Philadelphia

You realize, of course, that occupational safety is a comparatively new field. It has made considerable progress efforts to make American industry a safer part of man's endeavors. Some indication of this is found in the statistics published by the National Safety Council, the Bureau of Labor Statistics and others. Today's overall U. S. industry average of around 7[1] disabling injuries per million manhours worked represents a new low for that portion of industry which volun teers its injury frequency rate data. Three decades ago, this average was much higher, around 32.[2] If some vagueness with regard to the aforementioned figures is apparent, it is because the averages quoted by different groups vary somewhat.[3] In general, the greater the number of companies included, the higher will be the average for the group. But this is also the clue as to how little progress, relatively, has really been made, or, to express it more kindly, how much room for improvement still remains throughout the nation. For if that minority[4] of companies which has at least enough interest to keep records of its accidents and to offer to share such information with others for the common good has individual frequency rates as high as 20 and 30[5] (with an average of 7), what then of the vast majority which has shown no such interest?

FREQUENCY RATES LOOSE

Look at it this way. The National Safety Council estimates that there were approximately 2 million[6] industrial disabling injuries and deaths throughout the U. S. in 1953, and almost as many in 1954. A reasonable estimate of the exposure giving rise to these injuries would be 60,000,000[7] employees x 2000 working hours per year or 120 billion manhours. Thus, a more realistic average frequency rate for the nation's industry would be around 16. You can readily see then that the majority of companies not represented in the usual "average" frequency rates published, must, as a group, have a higher rate than the minority which *is* represented. Furthermore, when you consider that this represented minority accounts for a significant portion of those 120 billion manhours, you can see that the frequency rate of the majority group

must be higher than even our so-called "realistic" overall industry average, and consequently considerably higher than that of the represented minority. And, what's more, all of these averages still include in their computation the many billions of low hazard white collar man-hours. How many thousands of production plants, therefore, are perhaps unknowingly experiencing accidents (and injuries) at a rate ten and twenty times that of safety conscious firms? Most of these are small firms, true. And convincing them that there *is* a safety program that will fit their budget is merely a question of time, of course. But then what of the many large firms which are still carrying this uneconomic and unhumanitarian burden of high injury rates? Large or small, what firm can honestly say it can do nothing more to reduce accidents, injuries and damage?

PREVENTION PROGRAM NEEDED

Disregarding a very small percentage of wilfully unscrupulous people in the world, we are left with a situation which would seem to indicate that an overwhelming number of our business managers are falling down on the job of adequately protecting their investment in people and equipment, not to mention humanitarian standards. Can it be that these men have overlooked such an important item when "taking inventory," or to put it another way, have just not examined their safety conscience lately? I think this is the case. For surely, such an examination would reveal to them their poor safety performance or at least their ignorance of such performance. At the management level this can only be a question of what philosophies are being adhered to. If a manager is at all conscientious, he realizes he has a moral obligation to do his practical utmost to protect his employees against mechanical hazards and the hazards of their own behavior, at least while they are performing in his behalf. What then represents his practical utmost? Can it be less than the more successful of the neighbors in his class? There can only be one answer. He must solemnly pledge himself to cut this costly, inhumane accident ogre down to size by efficiently using every weapon of which he can reasonably avail himself. In short, he will not accept for longer than a trial period any program which does not produce results.

This brings us back to the question we diverged from a while ago, namely,

NATIONAL MEETING DATES
1956

April 28, 1956.....Board of Directors
June 22, 1956.....Executive Committee
June 23, 1956.....Board of Directors

what safety fundamentals will help the manager to establish a proper framework for the variety of programs which are conceivable but which he will not directly supervise? This is essentially what you're asking when you want to know how certain basic principles of safety can help you to help your safety director. This subject is such an important one that you would be doing yourself an injustice not to devote the little time needed to read the professional treatment of it in the literature used by the universities offering courses in safety. There are relatively few books in this field and a complete survey of what's been said on this aspect of safety will not take long, but it *is* important that you do this yourself and not accept a relayed version. I think you will appreciate this point more after you look into this matter further and begin to see the numerous misapplications and misconceptions which are possible. Needless to say then, it would not help much for me to attempt to summarize all of the basic safety principles for you. Besides, I might be selling you short—not purposely, of course, but inadvertently. The principles are really generalizations which have been boiled down from a mass of experience. As you know, great care must be taken in making such generalizations. You should also appreciate that even greater care should be taken in applying them. It is essential then that you get the background available only in the literature. You simply cannot afford to learn by trial and error. After all, you're not paying the full cost, you know.

SIGNIFICANT SAFETY QUESTIONS

You should be sufficiently interested by now to follow this thing through on your own. Before doing so, however, you might find that it helps to itemize some of the things you'll want to know. For instance, should you gear your program to emphasize promotion or engineering or both? If both, what kind of balance should there be? You've probably heard that unsafe acts generally outnumber mechanical hazards 85 to 15. Does this mean that engineering should *not* be considered as a primary solution? Should your records deal only with disabling injuries or are all accidents important for analysis purposes? What about accident proneness? Should this be concentrated on in the early stages of your program or only after you've brought the frequency rate down to a fairly low level? And what can you do about it? How much can you afford to spend on accident prevention? What are the indirect losses? Is the 4 to 1 ratio of indirect to direct costs applicable in your case? Which level of supervision can do most to make your program effective? How important is the frequency rate? The severity rate? What other ways can you appraise safety performance? What's the difference between direct causes, subcauses, and underlying causes? Against which of these should your primary efforts be directed? Is every accident the result of just one cause or should a combination of causes be looked for? What percentage of all accidents are considered preventable? What effect are poor morale, labor difficulties or similar problems likely to have on your safety efforts? Why is it important for you as president to issue a formal statement as to your policy on safety? How should you follow this up? Why must personal blame and discipline be kept to a minimum in safety work?

Well, if you're finally convinced, hop to it, don't waste a minute; one of your men might be seriously injured if you procrastinate. The next time you have lunch with one of your associates, ask him, "Have you examined your safety conscience lately?" ■

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(Numbers in parentheses correspond to references in the article).

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1956-57 S.A.M. National Officer Nominees

THE S.A.M. Nominations Committee was elected at the National Board of Directors Meeting on November 5, 1955. All chapters were requested to submit their nominations for National Officers. Based upon the recommendations made by the chapters to the Committee, all names submitted were carefully considered. The Nominations Committee met in January and recommended amendments to the S.A.M. By-Laws adding the positions of Chairman of the Board and Second Vice President to the Officers of the Society. On this basis, they have unanimously nominated the following officers for the 1956-57 term:

Frank F. Bradshaw, Chairman of the Board

John B. Joynt, President

Homer E. Lunken, First Vice President

J. Richard Jeffrey, Second Vice President

Dause L. Bibby, Secretary

James E. Newsome, Treasurer

At its meeting on January 28, the amendments to the By-Laws recommended by the Nominations Committee were approved by the Executive Committee, and these amendments were published in the February issue of *Advanced Management* (p. 22). Final consideration will be given the proposed amendments by the Board of Directors at its meeting on April 28. If not passed by the Board, only the nominations for President, First Vice President, Secretary and Treasurer will be acted on in the election of National Officers at this meeting.

George B. Estes, Chairman of Nominations Committee and Immediate Past President

Maurice M. Bachlotte, Southeastern Region

Harold Fischer, Middle Atlantic Region

Gwynne H. McConaughy, Central Region

E. Leslie Priestman, Northeastern Region

Chairman of the Board

FRANK F. BRADSHAW

New York Chapter

w S.A.M. President, past Executive Vice sident and National Director of the New k Chapter. Active in the Society since 6. Organizer and President of Richardson, ows, Henry & Company, management con- ants, New York. Former dean of the Uni- sity of North Carolina.

President

JOHN B. JOYNT

Asheville Chapter

w First Vice President, past National Treas- r. Active member since 1946. Manager of Administrative Engineering Department, erican Enka Corporation, Enka, North Caro- . Previously held positions with manufac- ing, banking, and transportation companies.

First Vice President

HOMER E. LUNKEN

Cincinnati Chapter

Treasurer, formerly Vice President of pter Operations and of the Central Re- , and President and National Director, cinnati Chapter. Active in the Society e 1944. Vice President, Assistant General nager, and Director of the Lunkenheimer mpany, Cincinnati, Ohio.

Second Vice President

J. RICHARD JEFFREY

Columbus Chapter

Now Vice President of Chapter Operations, formerly National Director for Columbus Chapter. Active member in Society since 1949. Leader in the development of the Central Region and chapter organization, policies, and procedures; Jeffrey Manufacturing Company, Columbus, Ohio.

Secretary

DAUSE L. BIBBY

Binghamton Chapter

New Secretary, formerly Director for Binghampton Chapter. Active in Society since 1952. Executive Vice President, Daystrom Incorporated, Elizabeth, New Jersey; formerly Vice President, International Business Machines, New York. One of those responsible for the organization of the Binghamton Chapter.

Treasurer

JAMES E. NEWSOME

Chicago Chapter

Past National Secretary, National Director, President and Executive Vice President of the Chicago Chapter. Active Member of the Society since 1948. Superintendent, Johnson & Johnson, Chicago; previously with Continental Can Company and United States Steel Corporation.

Maintenance costs will become a larger part of the total manufacturing expense as mechanization and automation develop. Time standards for maintenance work will be as necessary for the factory of the future as they are now for production operations. The special characteristics of maintenance work are discussed, the techniques which are most effective in setting standards, the effect on the basic MTM motions and allowances, and the administration of time standards for maintenance operations.

Setting Time Standards On Maintenance Work

By James G. Bralla
Staff Consultant
Methods Engineering Council
Pittsburgh, Pennsylvania

AS the trend towards mechanization and automation of America's factories continues, the maintenance of production facilities will become an ever-increasing problem. The overhead attributable to maintenance can be expected to form a larger and larger portion of total manufacturing costs. Maintenance will become an increasingly fertile area for savings through the application of techniques of scientific management. The use of time standards for maintenance work will be one major means through which maintenance costs will be controlled and reduced.

In the past, time standards have been seldom attempted on maintenance work because of the apparent immensity of the task. The physical work involved in setting standards on such a wide variety of operations has always appeared to be out of the question, particularly since the varying conditions under which maintenance operations take place insure that "no two maintenance jobs are alike."

In recent years, however, the advent of MTM and other advanced techniques of work measurement have simplified the task of standard setting, particularly on work of low repetitiveness. The question, therefore, arises: Do these new techniques simplify the job of standard setting sufficiently so that the savings resulting from the standards outweigh their cost? If so, what special techniques are involved in using them and in making standards practical for maintenance? It is the purpose of this paper to answer these questions.

Briefly, it can be said that it is practical at this time to establish standards on maintenance work. Some special problems and techniques arise that this paper will discuss.

In most maintenance situations, one craftsman or maintenance group performs a variety of operations. A typical pipefitting job, for example, will usually involve measuring the work site to determine the pipe length needed, cutting pipe to length, threading pipe, assembling fittings to pipe at floor level, installing the sub-assembly overhead, making pipe supports, and testing the finished installation. These operations are in addition to the obvious ones of preparing for the job, cleaning up afterwards, and traveling to and from the work site.

Because of this large number of operations, it is necessary to set many standards in order to cover the work of one maintenance group. This is costly in comparison to highly repetitive production work where one or two elements sometimes comprise an entire standard which may cover the work of several people.

The situation is not as difficult as it may appear, however. The major difficulty in establishing time standards for a maintenance department lies at the beginning. As the work continues, it gets progressively easier. This is chiefly because many of the data, once established, are applicable to a surprisingly wide range of craft work. For example, the time required for climbing or moving a ladder is the same for most crafts; the time required for tightening nuts on pipe flanges is the same as that required for tightening the same type of nuts on machines. As a result of this

JAMES G. BRALLA

After receiving his B.S. in Mechanical Engineering from Princeton, James Bralla worked as production engineer for the National Carbon Company, and since 1953 has been staff consultant with the Methods Engineering Council. He has worked on the development and administration of time standards for maintenance operations with several companies, and presents some practical conclusions about their feasibility and effectiveness in this article.

each successive craft that is covered by standards finds an increasing amount of time data available from previous studies. In fact, in the whole area of maintenance, there is a surprising recurrence of certain elements which appear again and again in the course of the work. Such elements as "obtain pencil from pocket," "move ladder," "position wrench," and "turn screwdriver" are examples.

In addition to this, there is a larger "mix" of elements in the work of one department or one individual that allows more margin for error in establishing any one element time. This reduces the exactness which must be achieved in developing element times and thereby simplifies the work.[1]

STANDARD DATA METHOD

The basic approach in establishing standards for maintenance work is the standard data method. That is, time data are established for all anticipated operations for each craft. Then, for each job, either before or after it is performed, the work is analyzed and the appropriate standard data are applied.

The chief problem with maintenance standards is not the standards themselves, but the administration of them; i.e., the transferring of standard time data into job standards for actual maintenance work. It is relatively easy to establish a standard for any manual activity. It is not always easy to determine by an economical method just when or how many times that activity is to be performed, particularly when one is dealing with jobs that almost never occur more than once with any one combination of elements. It is not the function of this paper to deal with the administration of time standards for maintenance, only with their establishment. Suffice to say, there are techniques available which allow standards to be administered economically.

A major problem in setting the standards has to do with frequency. Ideally from the standpoint of accuracy, there should be a separate standard for each variation in method of each element. For example, the element "climb ladder" might have several different time values, depending on the number of steps climbed. However, establishing several values for elements like this one would result in a system which is impractical. The necessity of analyzing each element of the job to determine which value is applicable would make the cost of applying the standards prohibitive. In actual practice only one or two values of this element would be used, each value based on an average number of steps.

With MTM, an excellent tool is provided for analyzing different variations and arriving at the true average condition. It is also necessary to make frequency studies to determine the weighting of different values when they are averaged together. Sometimes frequency studies can be made from observations of jobs in progress; sometimes they are made by examining completed work, or materials, tools, or equipment not necessarily in use.

The engineer making MTM or time studies of maintenance operations must adjust his thinking somewhat with respect to the acceptance of apparently less effective motion sequences. He must become acclimated to the fact that many motions that would appear unacceptable in the usual study are incorporated into a maintenance standard. Motion classifications are apparently more liberal and the amount of time allowed more generous.

This does not mean that MTM or any other predetermined times must be made "loose" when applied to maintenance or that the traditional "questioning attitude" can be discarded. Neither is the case. The real point is that the engineer must recognize that conditions are less favorable on maintenance work and the seemingly inefficient motions actually must be employed. This is because there is less opportunity for the operator to become familiar with one workplace or for the workplace to be set up for complete economy of manual motions. In addition, most maintenance operations do not recur frequently enough under the same conditions for a high level of skill to be developed.

EFFECTS ON BASIC MOTIONS

The following is a discussion of how the basic MTM motions are affected by the conditions under which maintenance work is performed:

Reach and Move: Longer distances are to be expected in analyses of maintenance work because tools and materials are usually located some distance from the point of use. Case "C" (to objects jumbled with others) are common since tools and materials are frequently jumbled.

Apply Pressure: This motion occurs more frequently on maintenance than on other types of work.

Position: The larger time values for this basic motion are found more frequently in maintenance work. Rules of application are unchanged, but there are more common occurrences of tighter fits, and less opportunity for the practice which makes otherwise difficult-to-handle parts easy-to-handle or which reduces the class of symmetry through prepositioning.

Grasp: There is no change in the rules of application. There is, however, a more prevalent occurrence of the more complex classifications of grasp than on production work that has been motion-studied.

Body Motions: It is in this area that maintenance work differs from most other manual operations. Bend, stoop, turn body sidestep and walk are very common motions in maintenance. They occur in many elements and often comprise most of the time allowed.

Eye Motions: Eye focus and eye travel are more prevalent as limiting motions because of the frequent examination and measurement of parts and materials in maintenance and repair work.

USING PREDETERMINED TIMES

Although this section has emphasized the basic motions which are performed relatively inefficiently as a result of the conditions under which maintenance is performed, it should be noted that there are certain elements or motion patterns that are repeated quite frequently and on which an operator does develop high skill. Examples are the pipefitter's use of a pipe wrench or a carpenter's skill at driving nails. However, the greater part of a maintenance craftsman's time is consumed by motions that are seldom repeated under identical conditions. Any correct analysis must accurately reflect this.

There is nothing wrong with making use of both time study and predetermined times on any one maintenance time standard or formula. Predetermined times are preferable, but if time study should prove to be more convenient in any particular situation it should be used. Time study and predetermined times, if both are used correctly, will give results which are consistent and comparable.

[1] The development of maintenance standards in a company is detailed in a forthcoming paper entitled, "Universal Maintenance Standards," to be delivered by Charles F. Stephenson at the 11th Annual S.A.M.-A.S.M.E. Management Engineering Conference. *(See Page 3.)*

However, it should be borne in mind that predetermined times do have definite advantages, regardles of the specific nature of the work. The most important advantage stems from the fact that with them time values can be developed by visualization. In many cases, time values will be needed where there is no opportunity for time study. When this happens, the analyst determines the motion pattern by visualizing from his experience or from discussion with or demonstration by a maintenance craftsman. Often time study and predetermined times can be used together in the development of a family of values, all justified by predetermined times, with those observable being verified by time study.

The most convenient and the generally preferred arrangement for maintenance time data is in the form of time formulas. Under this arrangement a separate formula is established for each maintenance operation, such as "Paint Machinery," "Cut and Thread Pipe," "Make Gaskets," "Replace Fuses," "Travel to and from the Job," and the like. The formulas will have final time values in the form of tables, curves, or algebraic expressions.

In this form, the range of work covered by any one formula will be a good bit less than that required for a job. It would be possible to establish formulas broad enough to cover several operations but this would result in cumbersome formulas.

OBTAINING SUMMARY VALUES

A better approach is to keep the formulas fairly narrow in scope, limiting them to one operation, and then combining formula time values as desired into summary values which allow time for performing frequently occurring combinations of operations. For example, a summary value for installing a length of air conditioning duct would be made up of time values from the following formulas: "Measure Site to Determine Material Requirements," "Sheet Metal Layout," "Shear Sheet Metal," "Bend and Assemble Sheet Metal," "Install Ductwork," and "Inspect and Test Finished Installation." Summary values for less frequently occurring combinations of operations can be arrived at by comparison. Summary values are added together, along with preparation and travel time, to determine the total job time. As new work that is likely to recur arises, it is easy to develop a new summary value from the time formulas involved.

It is important for the sake of economical administration that the number of final table values for each formula be reduced to as few as possible. This means that there must be some averaging in the standards of both time values and occurrences.

Actually, virtually all element time values involve averages of some variables so this concept is not new. Most elements cover some range of distances of reaches and moves, some range of variation in grasping conditions, and the like. Maintenance work differs only in the fact that the range of variation is greater and that more important factors are combined.

AVERAGING THE STANDARDS

There is no set rule as to the maximum range of values which can be safely averaged together. The convenience with which the characteristics can be determined separately should be the criterion. For example, it would be relatively costly to measure the length of each piece of pipe in a particular installation, so a time value is used which is based on an average length. In determining whether ladder time is needed, however, it is relatively easy to know in advance whether a ladder will be needed and this value can be applied accordingly.

The chief point to be made is this: Averaging should be done on the basis of frequency study results and not from simple, unweighted averages of certain values.

Allowances for fatigue, personal time, and unavoidable delay are added to the base time in maintenance time standards, as in other standards. The percent value added, however, is apt to be considerably more than for production standards. For complex machine repair or electrical or pipe installation, the allowance is apt to be 60 or 70 percent. Simple painting or light masonry work might have an allowance as low as 23 percent. Routine or preventive maintenance work usually needs less allowance than repair work, new installation, or construction.

Some of the factors which must be allowed for are the following:

1. *Personal and fatigue time*—about the same as required as for any other job requiring comparable exertion.

2. *Unavoidable delay*—the percentage allowed for this is apt to be relatively high for repair and new construction work, but not necessarily any higher for preventive maintenance work than for other non-repetitive operations. Included in this category in addition to delays is unavoidable extra work, such as that which arises when some unforeseen difficulty arises.

3. *Planning*—this includes time involved in deciding on a course of action or talking about the work to supervisors or co-workers.

4. *Balancing delay*—this occurs when two or more men are assigned to a job. It arises when one man cannot work due to interference from the other man or because momentarily there is no work for one of the men to perform. For example, it may be necessary to assign several men to a job in which some heavy steel is to be welded. Several men may be required to handle the steel members but only one will normally perform the actual welding. The waiting time of the other operators is balancing delay. Ideally, there should be no balancing delay; i.e., all operators should have productive work to perform at all times. In actual practice, however, a certain amount of balancing delay is unavoidable and time must be allowed. Normally, 10 to 20 per cent is added to the total time on 2 or 3-man jobs to allow for balancing delay.

The Ratio-Delay or Work Sampling technique is the recommended procedure to be used for getting information on which to base allowances. Comparisons should be made with allowances on existing time standards where conditions are comparable and, of course, judgment must be employed. It is important to make the ratio-delay study according to accepted techniques which insure that the work sample is random and representative of work actually performed. All-day time study can be used to get allowance information but the ratio-delay method is more economical and gives more representative results.

ADMINISTERING THE STANDARDS

Applying the standards economically is the key to success with time standards on maintenance operations. As was mentioned above, this is not an easy task. In recent years, however, many companies have gained experience in using time standards to control various non-repetitive activities which bear some similarity to maintenance work, such as in shipping departments and

tool rooms. Some of the techniques used to administer these standards are employed with maintenance standards. In addition, there are some new approaches that have been developed. In general, however, the basic techniques are fourfold and are summarized as follows:

1. Performance is measured on a group rather than on an individual basis.

2. Over-all performance is measured for a weekly or monthly period rather than for individual jobs. Individual jobs are considered only when the average performance over the whole period is unusually high or low.

3. When applying time standards to specific jobs, free use is made of comparisons rather than having exact data for each situation.

4. The standards, both formula and summary values, are expressed in as simple a form as possible.

The sum total of these devices can result in a system which will permit time standards to be applied to maintenance operations in such a way that the benefits will not be negated by high administration costs.

GREAT POTENTIAL SAVINGS

Time standards have been of great value in controlling and reducing labor costs on all types of factory operations. The potential savings from such application to maintenance operations is perhaps greater than on other operations. This is because maintenance work is more difficult to control by supervision alone, since it is never concentrated in one departmental area of a plant. In addition, maintenance departments have not, in general, been subject to the same degree of cost reduction scrutiny that has been directed to production operations. The potential savings, then, are ample.

In the past, these savings have always seemed out of reach, due to the difficulties involved in establishing and administering time standards on maintenance operations. The point that this article has attempted to demonstrate is that, given a systematic procedure for administration, time standards can now be established economically on maintenance operations with the aid of the newer work measurement techniques. The savings are now attainable. As mechanization and automation become more widespread, it will become imperative that they be realized. ■

CIPM Reports . . .

CIPM Finnish Project Completes First Successful Year

THIS month marks the end of the first year of the Council's management seminar program in Finland. The American team that is implementing the program is also a first, as it is the first project of its kind that the Council has organized and recruited on a privately sponsored basis.

The idea for the Finnish project originated at a meeting of the members of the International Committee for Scientific Management, of which CIPM is the American member. The representative from Finland sought advice and help from the CIPM representative on how to obtain aid for Finland in the fields of management techniques leading to higher productivity for the country. Funds were raised from interested groups in this country and in Finland, and last March, Mr. A. C. Howard, the recently retired President of the Globe Wernicke Company of Cincinnati, went to Helsinki to begin the project.

What he found in Finland was a country that is the northernmost outpost of a free people, with an 800 mile contiguous boundary with Russia. Most of the country's 4,000,000 population live in the southern half of the Finnish peninsula, where the climate is somewhat tempered by the Gulf Stream. In 1917, Finland declared her independence, after 108 years under Russia. Since then, she fought a terribly destructive war with Russia, who enforced the most stringent peace terms after the Second World War. Because of restrictions of this treaty and the influence of Russia, Finland was not able to receive the Marshall Plan aid given to other war devastated countries of Europe. Therefore, the country's technical and managerial know-how were far behind those of the United States.

To help to remedy this situation, Mr. Howard, the team leader, with the assistance of Mr. S. J. Aires, Manager of Commercial Research of the Lukens Steel Company in Pennsylvania, and Mr. Earl W. Eames, a production consultant from Boston, began a program that "aimed at improving the standard of living of the Finnish people through increased productivity, which in turn was accomplished by scientific management applied to all phases of the economic life of the country."

Their method is described by Mr. Howard as the "pick and shovel down to earth approach" on one front, and "the broader educational approach on the other front." The Americans' first activity was to visit the key industries of Finland, surveying their facilities, and counseling their top managements on improvements that would assist the firms. Mr. Howard reports that "after gaining an entré to the top managing director, out pattern of approach and operation differed in most cases. It might have started with a rather detailed survey of each of the divisions of the business or perhaps an intimate and searching look into some phases of the operations" which were known to be weak. In the accomplishment of their daily work, the American team members had the assistance of the office space and personnel of Rastor, a Finnish, cooperatively owned, non-profit management consulting group.

SEMINARS PLANNED

As a result of their work, the Americans have gained the confidence and support of Finnish management, so that now, the American team divides its time between individual consultations and seminar programs, which can, of course, reach a far wider number of people. The Association of Metal Industries has agreed to sponsor a series of seminars for about fifteen technical directors—the Finnish term for the top production man—from the largest metal firms in Finland.

As a mark of the American team's success, the Finnish and American sponsors have renewed the project for another year. All reports from Finland indicate that the Americans' work, which was originally confined largely to the metal industry, has now been broadened to encompass not only the operations of a number of other industrial and commercial organizations, but also all aspects of management from top management planning to supervisory control. ■

Jane Dustan, CIPM Editor

S.A.M. is a charter member of CIPM, the Council for International Progress in Management, the American non-profit, non-political organization devoted to the practice of scientific management on the international level. CIPM is in turn a member of the International Committee of Scientific Management (CIOS) which represents the organized management societies of twenty-six nations.

IN MEMORIAM—HARLOW STAFFORD PERSON

(Feb. 16, 1875 — Nov. 7, 1955)

IF a biographical sketch should go beyond a bare record of dates and positions, it should clearly try to assess the quality and character of the man and appraise his total contribution. Such assessment is difficult, if not impossible, because subjective factors are hard to weigh and because objective achievement should wait upon the future to be properly evaluated.

One is thus frankly left to express personal impressions and reactions, which is what I shall do here. But I do this eagerly, out of a long personal friendship with its warmth and responsiveness.

A VARIED CAREER

I memorialize to all who may have known him or known of him and his work, the career of Harlow Stafford Person. He was born in 1875 in a small town in Nebraska, and died in November, 1955, at his home in Dobbs Ferry, New York.

Between these dates was lived a life of extraordinary richness and usefulness. Harlow Person was a graduate and a Ph.D. (1902) from the University of Michigan. He went at once into the teaching of economics and management. By 1908 he had become Dean of the Amos Tuck School of Administration and Finance at Dartmouth College, which post he held until 1922. But he became in 1919 the part-time Managing Director of the Taylor Society in New York, and from 1922 to 1933 held this in a full-time capacity. He occupied thereafter various positions as consultant economist in Washington with special emphasis on the conservation of water resources, until in 1935 he became a staff consultant for the Rural Electrification Administration, an association retained until his death. In connection with his consulting work both in the Federal Government and under private auspices, he edited and wrote numerous papers, definitive documentary reports, and several volumes which were commercially published.

Perhaps most noteworthy in connection with his literary expressions was the issuance under his editing in 1929 of the interpretative volume "Scientific Management in American Industry." This statement was the most searching and comprehensive appraisal of the contribution to American management of the scientific management movement some twenty years after it had gained national momentum. And Dr. Person, in addition to selecting the contributors, himself wrote five important chapters. It was in connection with the cross currents of controversy about the meaning and place of scientific management, with special reference to organized labor's attitude toward it—including my own role as the editor with Harper & Brothers by whom this book was published—that I gained intimate acquaintanceship with Dr. Person's mind and spirit. In the period from approximately 1910 to 1925, there had been disturbing misunderstandings of the significance and social value of scientific management on the part of labor leaders; and Dr. Person stood calmly at the center of this intellectual storm helping gradually to elucidate the truth from the midst of passion and prejudice.

This was the era in which, in 1911, the important interpretation of this movement was given by Louis D. Brandeis, as an attorney before the Interstate Commerce Commission, with testimony now included in the current volume "Scientific Management," Harper & Brothers, 1947.

These several publications were evidences of a profound shift occurring in this decade in the shaping of which Dr. Person exerted a major influence. It was the shift from fear of improved management by organized labor to an acceptance of both the philosophy and strategy of assuring greater productivity through altered attitudes and various new techniques introduced by management and accepted by the unions.

GAINED LABOR'S GOOD WILL

Today this transition has long since been completed and the then bitter and resistive attitudes of organized labor toward improved management techniques have all but reversed themselves. And credit for much of the earlier trend toward this shift seems to me to be justifiably laid at the door of Dr. Person's labors as editor, lecturer, teacher and consultant.

His subsequent career in Washington —the details of which are less familiar to me except as reported informally by a friend of both of us, Morris Llewellyn Cooke, with whom he worked closely in public office—supplied splendid and conclusive evidence of his intellectual and social integrity in striving professionally for the definition and realization of the public interest in Federal administration. Even though Dr. Person occupied no top administrative post in the several agencies with which he was associated in the field of water and electric power conservation, he was able to achieve salutory influence in advancing honest administration and in the protection of small rural consumers from overweaning private corporate interests.

COURAGE AND INTEGRITY

In terms, finally, of the quality and character of the man, it can with confidence be affirmed that there was an outstanding quality of intellectual and social integrity in his stand on every issue with which he was associated. He was in the best sense incorruptible; never bitter and never involved in the trivia of personal or political frictions or factions. The differences of point of view on public issues in which he became involved were those of principle, which he was always able to defend with clarity and persuasiveness. And as the years went on, his sense of what Walter Lippmann has called "the public philosophy" of honesty, honor and courage, gained in strength, insight and influence.

All of these qualities added up to a total personal effectiveness which made him a force of permanent constructive value as a public servant.

If many meeting him casually did not find him an engaging or immediately congenial companion, this was not true for those who came to know him well and to whom he gave a steadfastness of personal devotion which was part of his incorruptibility.

The nation needs more such public servants. ■

Ordway Tead

New Management Writing . . .

HOW FOREMEN CAN CONTROL COSTS

By Phil Carroll, 301 pp. 101 illustrations, $4.00, 1955, McGraw-Hill Book Company, New York.

FOREMEN are continually perplexed by the perpetual pressure exerted by higher management on costs. Foremen in many industries have been promoted from the working ranks because of their ability to produce, not only in quantity but in quality. Those factors which were instrumental in their promotion now become most important in their workaday life as foremen. When they attempt to continue performing their duties in this way and management continually throws up roadblocks about costs, with which the foremen were not concerned as workers, they find it difficult to understand management's deep concern over costs.

Phil Carroll recognized this problem in his daily contacts with foremen and then attempted to find the answers. After many years of research and intimate contact with foremen, as well as with top management, he has put typical cost problems and their answers in simple and illustrative form. Here is a book long past due, a foreman's handbook on cost. The phrases we usually see in cost books, such as profit and loss statements, balance sheet, ledgers, accounts receivable, and accounts payable are omitted. The writer covers the entire field of costs in which the foreman participates, introducing in the early chapters the value of a sound economical structure in his company as well as in his country.

He expresses to the foreman and the employer the importance that a company be financially strong enough to withstand the burden of varying economic factors such as taxes, market changes, the need to maintain reserves to retain position in the competitive field, adequate cushions against recessions, and expenditures to improve the working conditions of the employees.

The problems foremen are faced with when discussing costs are recognized as genuine problems and are dealt with in a simple and sincere manner which is easily understandable.

If you are a foreman and are interested in controlling your cost and getting ahead, this illustrative book should be of considerable assistance to you. Compare your own personal problems with some of those outlined in the book and see how they were handled, such as:

1. Are your men working most of the time?
2. Do you desire to reduce time leaks and increase productivity?
3. Are you faced with production schedules being changed regularly due to rush and urgent orders? How does this affect you and your job? Can you do something about it?
4. Can you assist in reducing setups?
5. Is the time study man with you or against you? Find out how the time study man can help you and your department.
6. Do you believe your problems are greater than the other foremen? Take a look at how the other foremen feel about this.
7. Scrap is a thorn in the foreman's side. Read the many useful approaches to overcoming this problem.
8. Have you analyzed your material cost lately? Would you like to have many tips on how this cost can be reduced?
9. Maintenance is everybody's problem. Learn how others have solved their maintenance difficulties.
10. Have you made suggestions which your boss would not accept? You may find the reasons why and how to get them accepted.

These are but a few of the problems discussed with practical solutions.

This book should also be read by those in higher management who have dealings with foremen, as it presents the practical viewpoints of the foremen.

The channel of communication between management and foremen is often hampered by the lack of understanding of the others' problems. The problems between foremen and management are discussed, and practical solutions of these problems are illustrated. The last few chapters of this book cover some of the more recent problems confronting foremen, such as, the necessity for additional paper work in recent years, the importance of budgets and overhead control and how these tools can assist foremen to do a better job. As a result the foreman receives recognition for the better job, the attendant promotions and better pay, thereby acquiring a higher standard of living.

By F. E. Baker
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SUCCESSFUL EXECUTIVE ACTION

By Edward C. Schleh, Prentice Hall, Inc., Englewood Cliffs, N. J., 1956, 252 pp, $10.00.

Executives who are frustrated by the lack of definitive answers in the case method of teaching management will like "Successful Executive Action." Here's a book with a definitive answer for every case or rather a case to illustrate every proposition—and there are many propositions or "principles" as the author calls them. It takes seven pages to list them in the table of contents.

The eighteen chapters of the text which bears the subtitle "A Practical Course in Getting Executive Results" are grouped under four main sections that cover:

I. "The Methods That Get Results and How to Use Them."
II. "Getting Results from People."
III. "Getting Results from Yourself as Leader."

and finally:

IX. "The Key to Results: Building Men."

In the first section on "Methods" the author gives the "Dos" and "Don'ts" for securing results by (1) getting action, (2) delegation of authority, (3) control and (4) committees. His discussion of the Rule of Errors should be particularly helpful to managers who may be long on control but short on delegation of authority. Some of the author's advices must be applied judiciously (at least by junior executives) such as:

"Don't be afraid to cross organizational lines"
"Don't let the Controller run people"
"Should you 'Let cream come to the top'?"

The chapters (6 and 7) on how to get results from committees—even if they stymie you—should be required reading for every would-be group leader.

On "Getting results from people" (Part II), the author devotes three chapters to methods on (1) how to use staff, (2) how to make men accountable and (3) how to delegate or as

UNITED STATES BUSINESS PERFORMANCE ABROAD

The Case Story of The Creole Petroleum Corporation in Venezuela, by National Planning Assn., 1606 New Hampshire Ave., N.W., Washington, D. C. 1955. 116pp. $1.00.

MOTIVATION RESEARCH

A New Aid to Understanding Your Market. A research report by Motivation Research Associates, 341 Parlo Square Building, Boston. 1955. $10.00.

ECONOMIC NEEDS OF OLDER PEOPLE

By John J. Corson & John W. McConnell. Published by the 20th Century Fund, 330 W. 42nd St., New York City. 1956. $4.50.

MOTION AND TIME STUDY

By Gerald Nadler. Published by McGraw-Hill, 330 W. 42nd St., New York 36, N. Y. 1955. $7.50.

JOB EVALUATION

By E. Lanham. Published by McGraw-Hill, 330 W. 42nd St., New York 36, N. Y. 1955. $6.00.

INDUSTRIAL WAGE AND SALARY CONTROL

By Robert W. Gilmour. Published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. 1956. $7.50.

THE TERMS OF TRADE

A European Case Study by Charles P. Kindleberger. Published by The Technology Press and John Wiley & Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. 1956. $9.00.

GOVERNMENT STATISTICS FOR BUSINESS USE

Edited by Philip M. Hauser & William R. Leonard. 2nd Edition. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. 1956. $8.50.

LABOR RELATIONS & PRODUCTIVITY IN THE BUILDING TRADES

By William Haber and Harold M. Levinson. Published by University of Michigan, Ann Arbor. 1956.

LINEAR PROGRAMMING: The Solution of Refinery Problems

By Gifford H. Symonds. Published by Esso Standard Oil Co., New York. 1955.

STANDARD HANDBOOK FOR ACCOUNTANTS

Prepared by 62 Specialists and edited by J. K. Lasser Tax Institute. Published by McGraw-Hill, 330 W. 42nd Street, New York. 1956. $15.00.

it is called "How to build reliance on your men." In addition, two chapters (8 and 12) are devoted to some 17 miscellaneous techniques for getting results from people.

Some of the subtitles such as "How to make friends of line and staff" are intriguing and deserve more attention in future editions.

Part III (chapters 13-17) is devoted to rules for self-improvement. The leader is advised to (a) discipline himself, (b) to have a purpose and to keep it and (c) to never stop growing by "letting well enough alone." In the case examples from industrial situations the author is not adverse to advising a little drivership when leadership fails.

Part IV on "Building Men" briefly summarizes the personal growth that can result from (a) setting goals, (b) delegating responsibilities, (c) "calling to account," (d) thinking ahead and (e) giving direction.

The author has assembled many concepts of management into a rule-book intended for the guidance of those who desire to improve their proficiency as operating executives. A list of "Dos and Don'ts" is ordinarily not a safe tool to place in the hands of a beginner. Schleh's book is recommended to those who can visualize not only the illustrative examples in the text, but also personal experiences to which the given principle may apply. ■

George Corless
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BETTER FOREMANSHIP

Key to Profitable Management. Revised Second Edition, 1955, by Rexford Hersey, Clinton Press, $6.00.

A GREAT deal of effort has gone into the preparation of training materials for supervisors and foremen. Books and "canned" courses are plentiful. Many say, "No more canned courses for me"; others, "They are the best we can provide, because we haven't the talent to prepare our own." A few have tailor-made manuals and feel reasonably satisfied. Nothing in the reading line seems to be entirely acceptable, because, "Foremen won't read." That is the real problem in supervisory training; that is why so many training specialists have turned to motion pictures, role-playing and conferences to ease their burden.

"Better Foremanship" is a classic in the field of book literature for supervisory training. This revised edition tells anyone who will read what the foreman should be doing. The trainee can find out here in what skill he should be training. A conference leader might try the Sunday School method of reading selected passages from this book out loud in foremen sessions as a basis of discussion. He might try assigning short reading references related to local problems for discussion. Any way used, the book should provide informative content so lacking in much supervisory training today.

Hersey sees supervisory training as making all the difference between a "good" and a "poor" company, a profitable and an unprofitable enterprise, one that runs smoothly and one that doesn't. He addresses himself to the foremen, giving them from his years of experience what he considers as the tools of good foremanship; and then, through them, he has a word for managers on how management affects good foremanship.

He deals with the specific skills of foremanship: interviewing, job analysis, job training, safety training, shop administration, work organization, and finally with the foreman as an assistant to management. This is done with practical illustrations, analysis of operating problems, schedules and rules of performance, methods of operation and with a variety of problem tests for which the correct answers are explained in detail.

Those foremen not interested in doing their job better, or at least in trying new ways, will find this dull reading, but for those who want to learn, there is much for them here.

The "fountain of training" for supervisors, to pervert the traditional statement slightly, does not flow of itself at the doorway of first or second line supervision. Only will it flow there if it flows higher up, in what management does and wants, as Hersey clearly shows in this work. Supervisors do what managers do, like children do what their parents do, to a considerable degree. Thus it is well for managers to read this book, for, after all they are only supervisors who take an elevator to a higher floor. ■

Douglas H. Fryer
Vice President, Richardson, Bellows, Henry & Co., Adjunct Professor, New York University, and Consultant, Standard Oil Co. (NJ)

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MAY CHAPTER ACTIVITIES

CHAPTER	SUBJECT	SPEAKER	TITLE	PLACE	DATE
Alabama	Coordination between Production Management and Distribution	R. E. Brooker	Vice President in Charge of Factories, Sears, Roebuck & Co., Chicago, Illinois	Tutwiler Hotel	8
Binghamton	Human Relations in Management	Matthew M. Gouger	V.P., General Aniline & Film Corp.	Arlington Hotel	9
Boston	How to Think Creatively	John E. Arnold	Professor, M.I.T.	Faculty Club, Sloan Bldg., M.I.T.	3
Bridgeport	Annual Dinner Meeting	Chairman: David H. Carpenter		Algonquin Club	1
Central Penn.	Some Major Management Tasks for 1956	Forrest Kirkpatrick	Asst. to President, Wheeling Steel Corp., Wheeling, W. Va.	Camp Hate-to-Leave-It	17
Chicago	The Guaranteed Employment Plan, One Year After	Joseph Germane	CIO-USA, Chicago	Furniture Club of America	29
	Standard Time Data and Multi-Variable Elements	V. Genger	Florence Stove Co.	Furniture Club of America	5
	Linear Programming Seminar to Be Developed During Year by Group	James H. Sartain	Armour and Company	Hardings Presidential Grill	1
	Follow-up on the Moral Survey of Previous Month			Abbott Hall, Northwestern U.	7
Clearing	Makeup of a Growth Company	L. F. Weyand	Exec. V.P., Minnesota Mining and Mfg. Company	Industrial Clearing Club	10
Cleveland	Cost Reduction Clinic	Robert D. Walser, Chairman		Lake Shore Country Club	7
Columbus	Annual Business Meeting				10
Dayton	Planning for an Expanding Dayton	Robert E. Smith, Chairman			29
Georgia	Industrial Engineering and Management at Home			Briarcliff Hotel	17
Greensboro	Annual Ladies' Night			Plantation Supper Club	15
Greenville	Watch Your Southern Accent	Grady Grant	Personnel Dir., Dixie Mercerizing Co., Chattanooga, Tenn.	Elks Club	
Hudson Valley	Defining, Selecting & Training Systems Men	Elles Derby	Director of Management Training, Metropolitan Life Insurance Co.	Hendrick Hudson Hotel	1
Indianapolis	The Guaranteed Annual Wage Versus the Stock Market	Charles Galbreath	Merrill, Lynch, Pierce, Fenner & Beane	Marble Ball Room, Marott Hotel	10
Kansas City	The Factory of the Future	M. J. Murphy	Editor, "Factory Management and Maintenance"	President Hotel	15
Knoxville	Industry's Responsibilities on Civic and Welfare Projects	Guy B. Arthur, Jr.	President, Guy Arthur & Assoc., Inc.	Holston Hills Country Club	8
Lancaster	Let's Manage as Well as We Know How	H. B. Maynard	President, Methods Engineering Council	Hotel Brunswick	15
Los Angeles	Management of the Sales Function	to be announced			17
Madison	President's Night	Kenneth Brastad	President, U. of Dallas		9
Milwaukee	Communications — A Two Way Street	John F. Simons	Manager, Employee & Plant Community Relations, General Electric Co.	E.S.M. Building	10
Montreal	Annual Business Meeting			Ritz-Carlton Hotel	9
Nashville	Ladies' Night			Andrew Jackson Hotel	11

MAY CHAPTER ACTIVITIES — (Continued)

CHAPTER	SUBJECT	SPEAKER	TITLE	PLACE	DATE
New Haven	Ladies' Night—Annual President's Report			Ye Castle Inn	24
New Orleans	Presidential Address	Winslow J. Chadwick	President, New Orleans Chapter, S.A.M.	Roosevelt Hotel	18
New York		Don Mitchell		Rainbow Grill, Rockefeller Plaza	17
Northeastern Pennsylvania	Vertical and Horizontal Cooperation Within the Industrial Team	Jacob J. Blair	University of Pittsburgh	Hotel Jermyn	7
Northern New Jersey	M.T.M.—Training Course	Phil Carroll			3, 10, 17
Philadelphia	Significant Trends in Manufacturing	Matthew J. Murphy	Editor, "Factory Management and Maintenance"	Poor Richard Club	1
Pittsburgh	Can the Atom Be Harnessed on a Practical Cost Basis	Paul D. Foote	Executive V.P., Gulf Research Labs.	Gateway Plaza	17
Portland	Prefab Housing	Tom Miles		Public Service Bldg.	23
Providence	Long Term Planning	William C. Wichman	V.P. & Gen. Mgr., Industrial Power Components Div., General Electric Co.	Brown Faculty Club	3
Raritan Valley	Cost Cutting Control Thru Records Management	Robert A. Shiff	National Records Management Council	Roger Smith Hotel	17
Sacramento	Case Study of Procter & Gamble — Management Techniques Used to Assure Success	Phil S. Willard	Plant Superintendent, Procter & Gamble Mfg. Co.	Capitol Inn	1
Trenton-Delaware Valley	Local Industry Display and Demonstration Night			Hotel Hildebrecht	15
Twin City	Student Chapter Meeting	Ted Lindbom		University of Minnesota	10
Washington	Automatic Systems for Office Work			Rm. 1143, Lafayette Bldg.	9
	Recent Management Research Developments			Rm. 5139, G.S.A. Bldg.	10
	Program Budgeting				8
	Work Measurement, Simplification & Standards			Rm. 5041, Post Office Confer.	23
	Management of Research & Development Activties			Na. Science Foundation	9
	Scientific Management in the Home			Rm. 1143, Lafayette Bldg.	14
	Management Problems in Overseas Activities			Rm. 200, Foreign Serv. Institute	24
	Financial Management			G.A.O. Auditorium	22
Western Mass.	Fifth Annual Conference				16
Western N. C.	Communications in Industry	Ed Crothers	Dir. of Ind. Engrg., James Lees & Sons Co.	George Vanderbilt Hotel	16
Wilmington	Can Business Men Afford Not to Participate in Public Service	John W. Rollins	Lieutenant - Governor, St. of Del.	Lord De La Warr Hotel	8
Worcester	Current Legislation Affecting Massachusetts Industries	Honorable Jarvis Hunt	General Counsel, Associated Industries of Mass.		14

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